FIG. 1

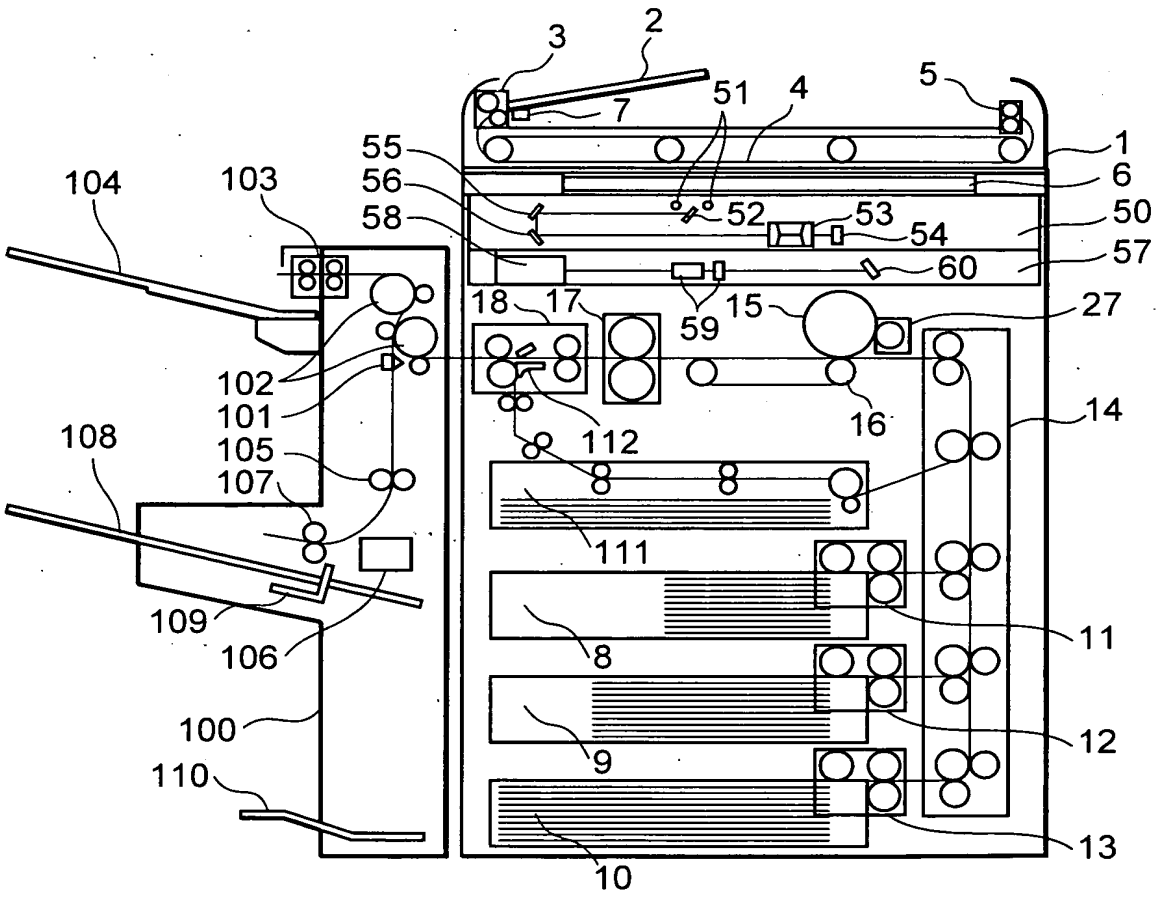

3
2
5
51
4
7
1
55
6
104
103
56
52
53
50
58
54
57
60
18
17
59
15
27
102
101
16
14
108
105
112
107
111
109
11
106
8
100
12
9
110
13
10

FIG. 2

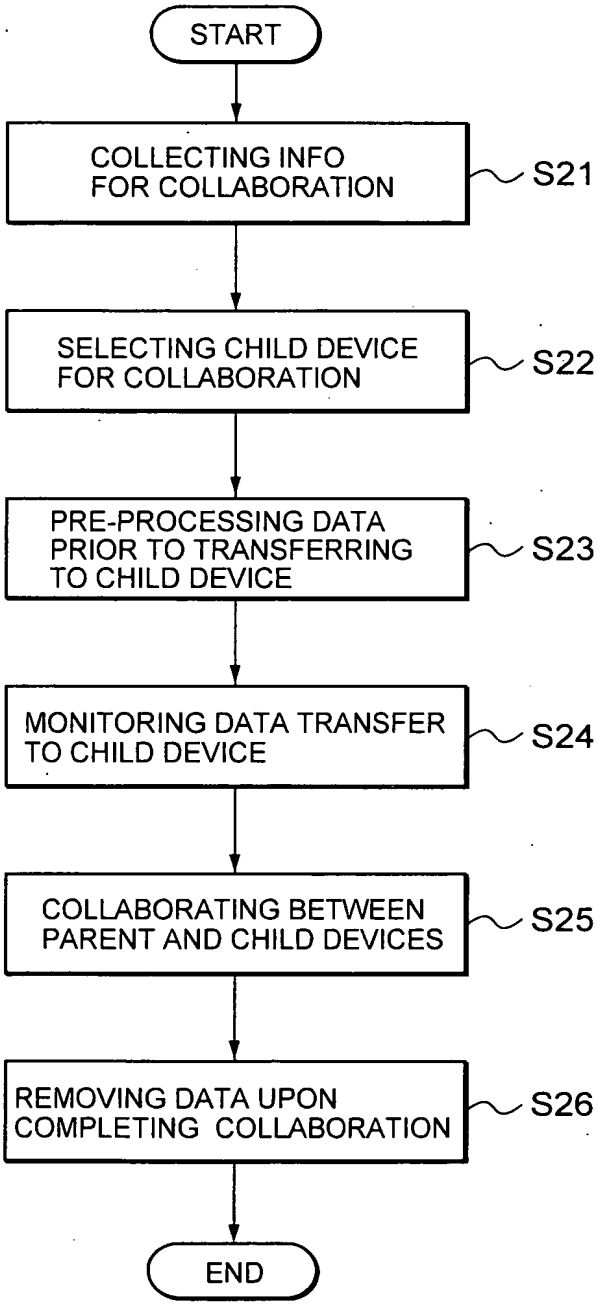

START
COLLECTING INFO FOR COLLABORATION
S21
SELECTING CHILD DEVICE FOR COLLABORATION
S22
PRE-PROCESSING DATA PRIOR TO TRANSFERRING TO CHILD DEVICE
S23
MONITORING DATA TRANSFER TO CHILD DEVICE
S24
COLLABORATING BETWEEN PARENT AND CHILD DEVICES
S25
REMOVING DATA UPON COMPLETING COLLABORATION
S26
END

FIG. 3

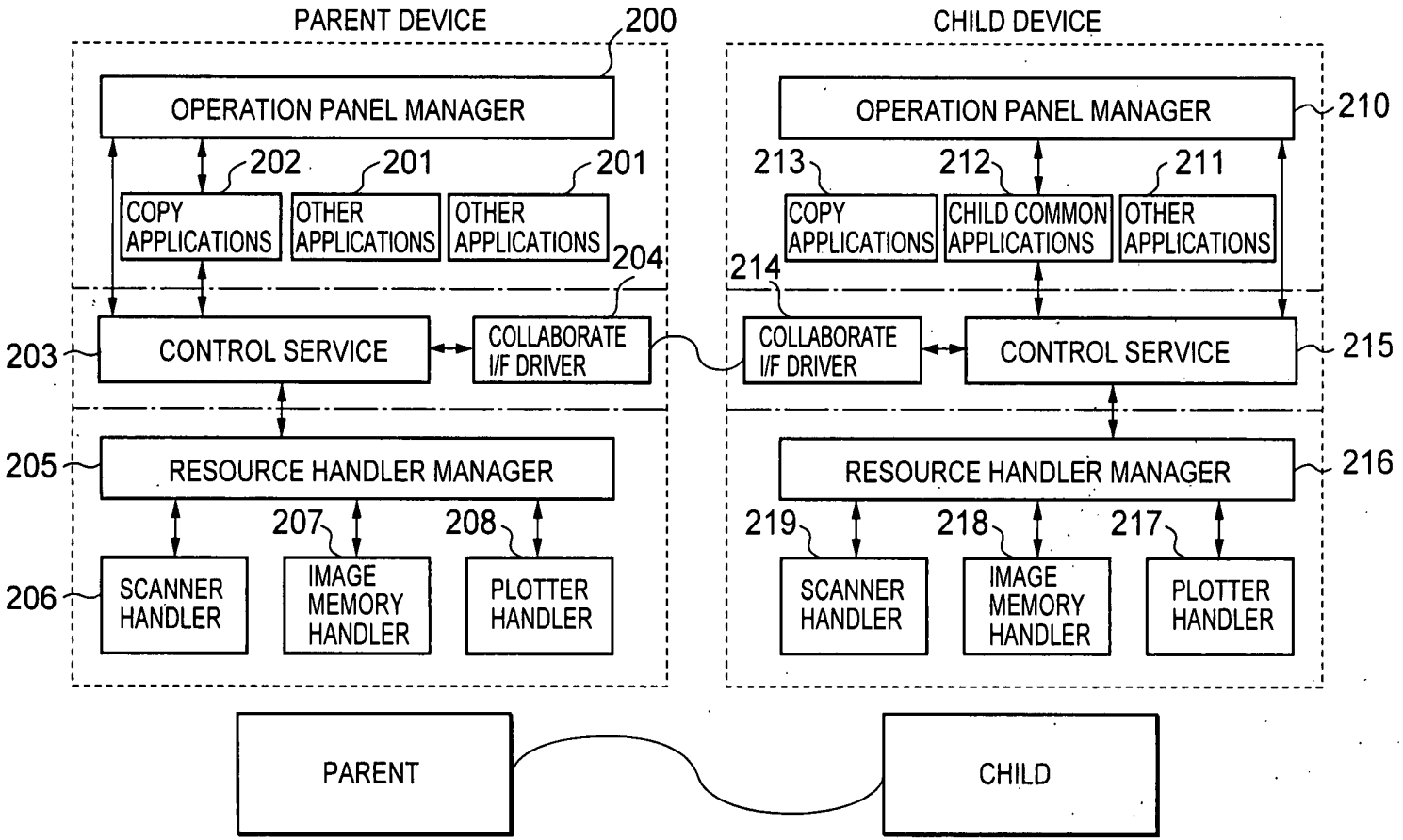

PARENT DEVICE
200
OPERATION PANEL MANAGER
202
201
201
COPY APPLICATIONS
OTHER APPLICATIONS
OTHER APPLICATIONS
204
203
CONTROL SERVICE
COLLABORATE I/F DRIVER
205
RESOURCE HANDLER MANAGER
207
208
206
SCANNER HANDLER
IMAGE MEMORY HANDLER
PLOTTER HANDLER
CHILD DEVICE
OPERATION PANEL MANAGER
210
213
212
211
COPY APPLICATIONS
CHILD COMMON APPLICATIONS
OTHER APPLICATIONS
214
COLLABORATE I/F DRIVER
CONTROL SERVICE
215
RESOURCE HANDLER MANAGER
216
219
218
217
SCANNER HANDLER
IMAGE MEMORY HANDLER
PLOTTER HANDLER
PARENT
CHILD

FIG. 4

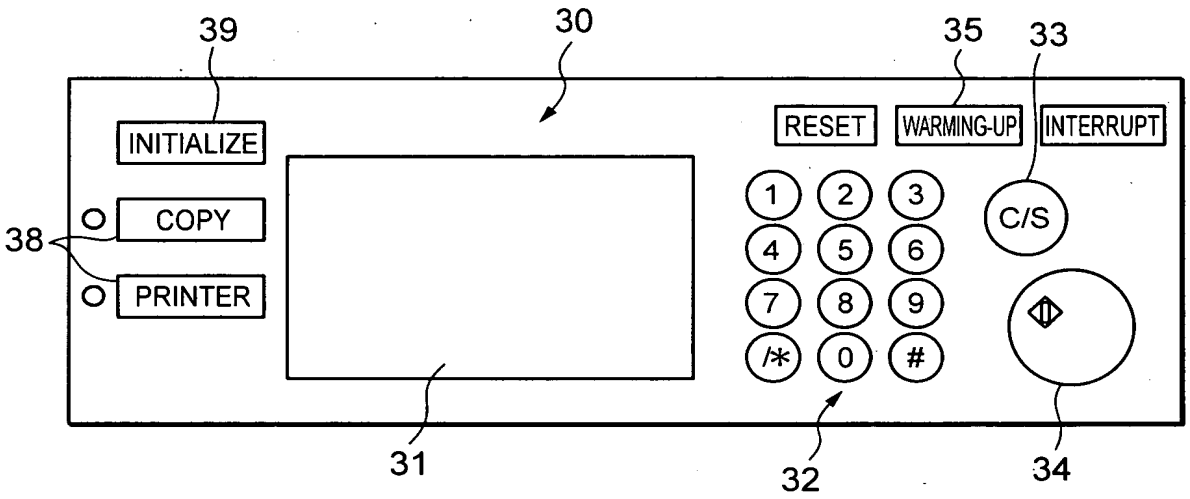

39
30
35
33
INITIALIZE
RESET
WARMING-UP
INTERRUPT
COPY
38
PRINTER
1
2
3
4
5
6
7
8
9
/*
0
#
C/S
31
32
34

FIG. 5

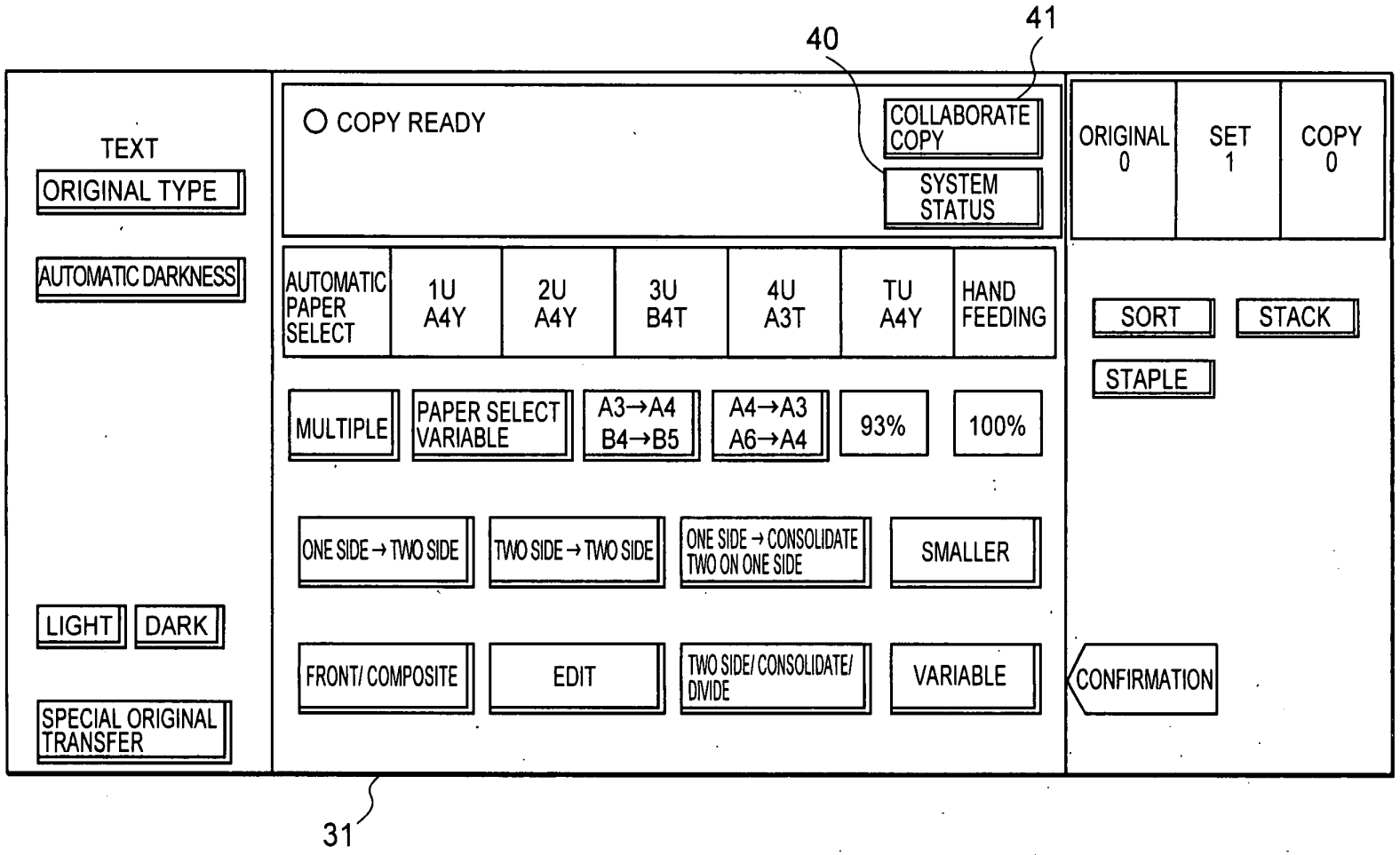

40
41
TEXT
ORIGINAL TYPE
AUTOMATIC DARKNESS
LIGHT
DARK
SPECIAL ORIGINAL TRANSFER
COPY READY
COLLABORATE COPY
SYSTEM STATUS
ORIGINAL 0
SET 1
COPY 0
AUTOMATIC PAPER SELECT
1U A4Y
2U A4Y
3U B4T
4U A3T
TU A4Y
HAND FEEDING
SORT
STACK
STAPLE
MULTIPLE
PAPER SELECT VARIABLE
A3→A4 B4→B5
A4→A3 A6→A4
93%
100%
ONE SIDE → TWO SIDE
TWO SIDE → TWO SIDE
ONE SIDE → CONSOLIDATE TWO ON ONE SIDE
SMALLER
FRONT/ COMPOSITE
EDIT
TWO SIDE/ CONSOLIDATE/ DIVIDE
VARIABLE
CONFIRMATION
31

FIG. 6

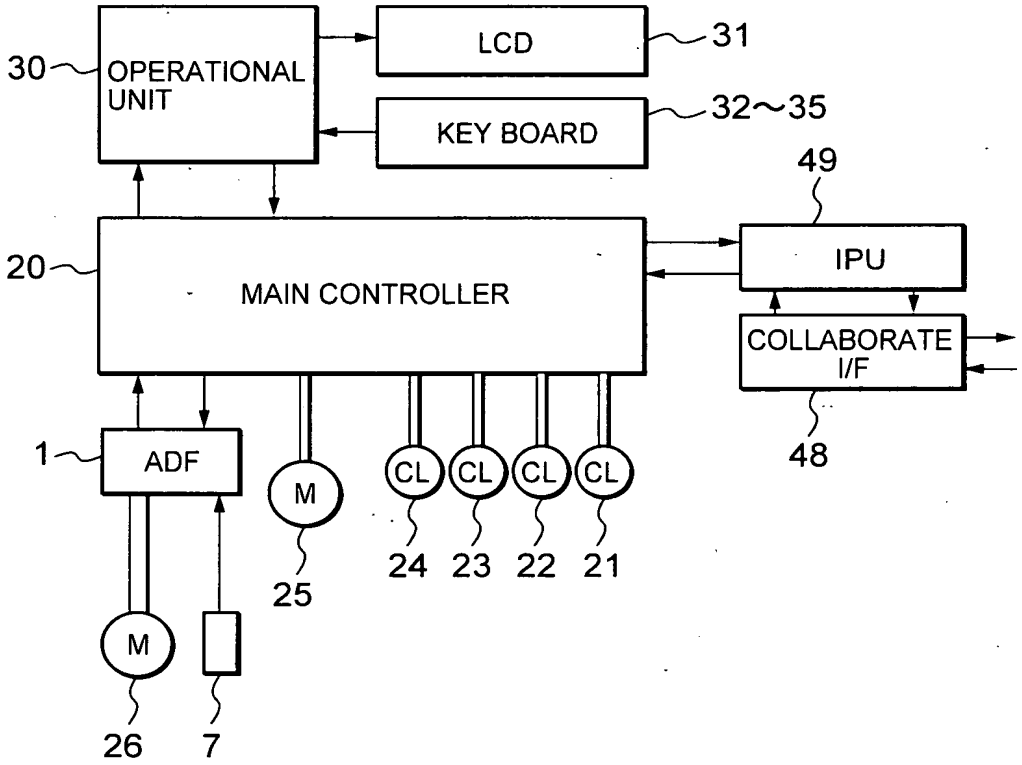

30
OPERATIONAL UNIT
LCD
31
KEY BOARD
32~35
49
IPU
20
MAIN CONTROLLER
COLLABORATE I/F
48
1
ADF
M
CL
CL
CL
CL
24
23
22
21
25
M
26
7

FIG. 7

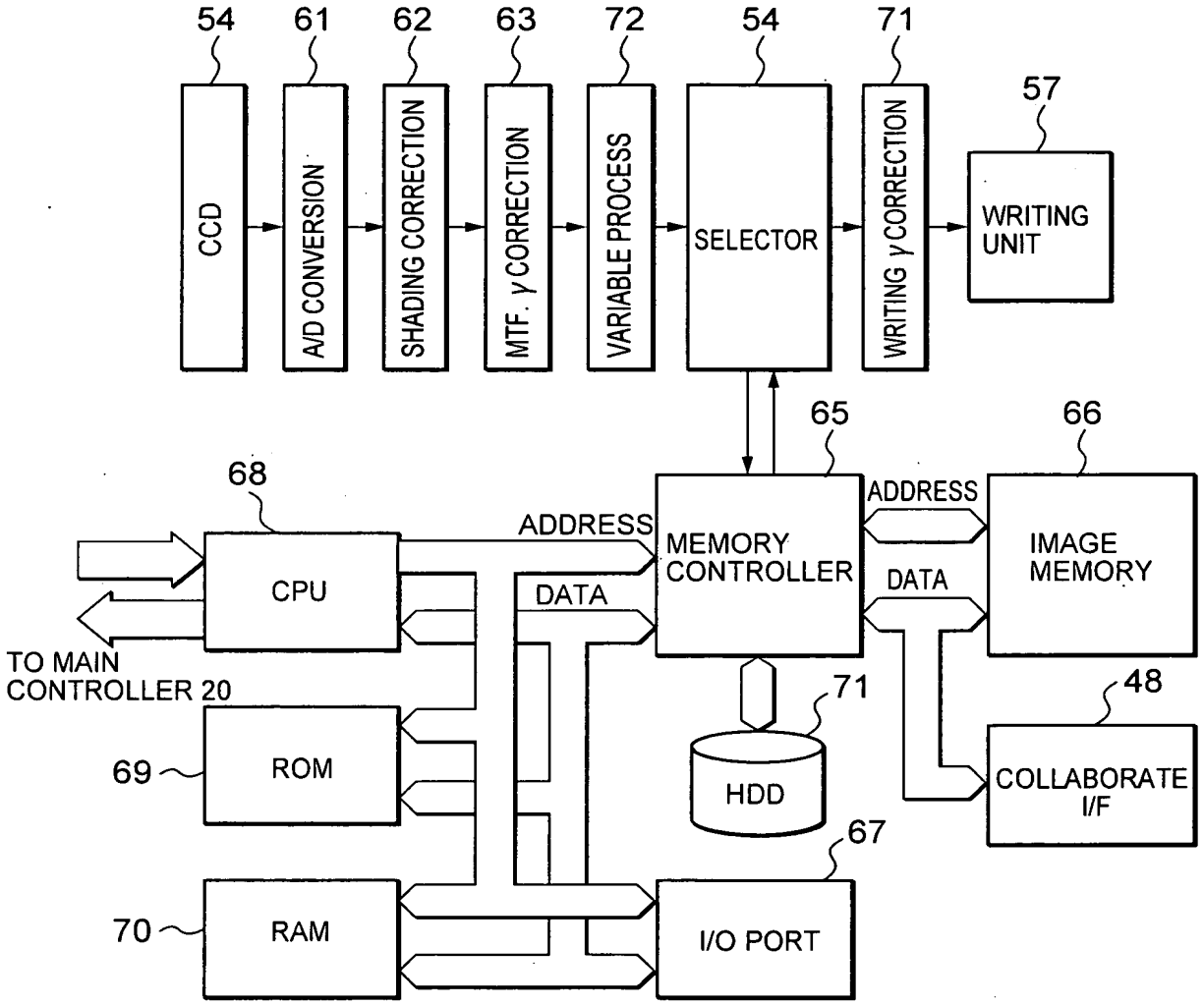

54
61
62
63
72
54
71
57
CCD
A/D CONVERSION
SHADING CORRECTION
MTF. γ CORRECTION
VARIABLE PROCESS
SELECTOR
WRITING γ CORRECTION
WRITING UNIT
65
66
68
ADDRESS
ADDRESS
MEMORY CONTROLLER
IMAGE MEMORY
CPU
DATA
DATA
TO MAIN CONTROLLER 20
71
48
HDD
COLLABORATE I/F
69
ROM
67
70
RAM
I/O PORT

FIG. 8

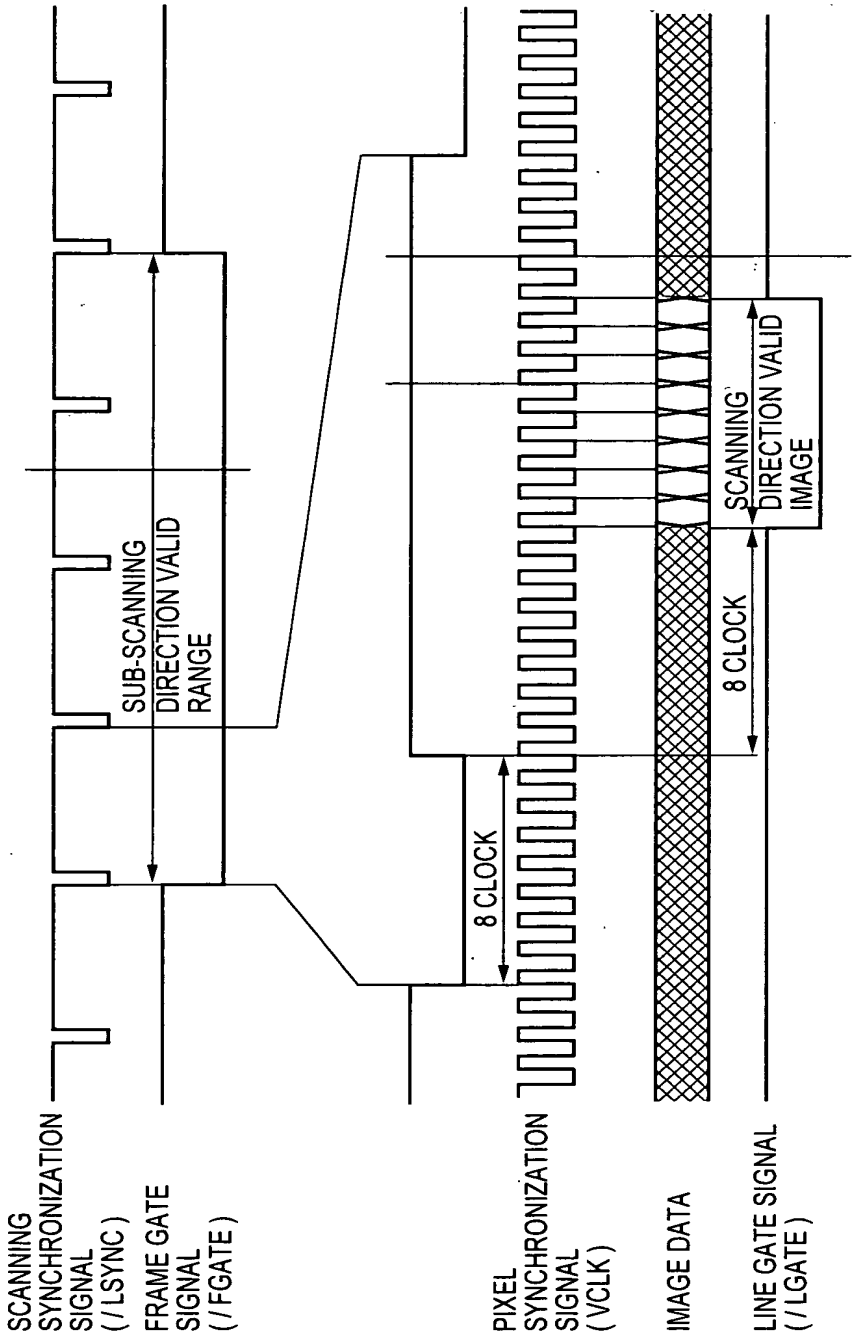

SCANNING SYNCHRONIZATION SIGNAL (/LSYNC)
FRAME GATE SIGNAL (/FGATE)
SUB-SCANNING DIRECTION VALID RANGE
8 CLOCK
PIXEL SYNCHRONIZATION SIGNAL (VCLK)
IMAGE DATA
8 CLOCK
SCANNING DIRECTION VALID IMAGE
LINE GATE SIGNAL (/LGATE)

FIG. 9

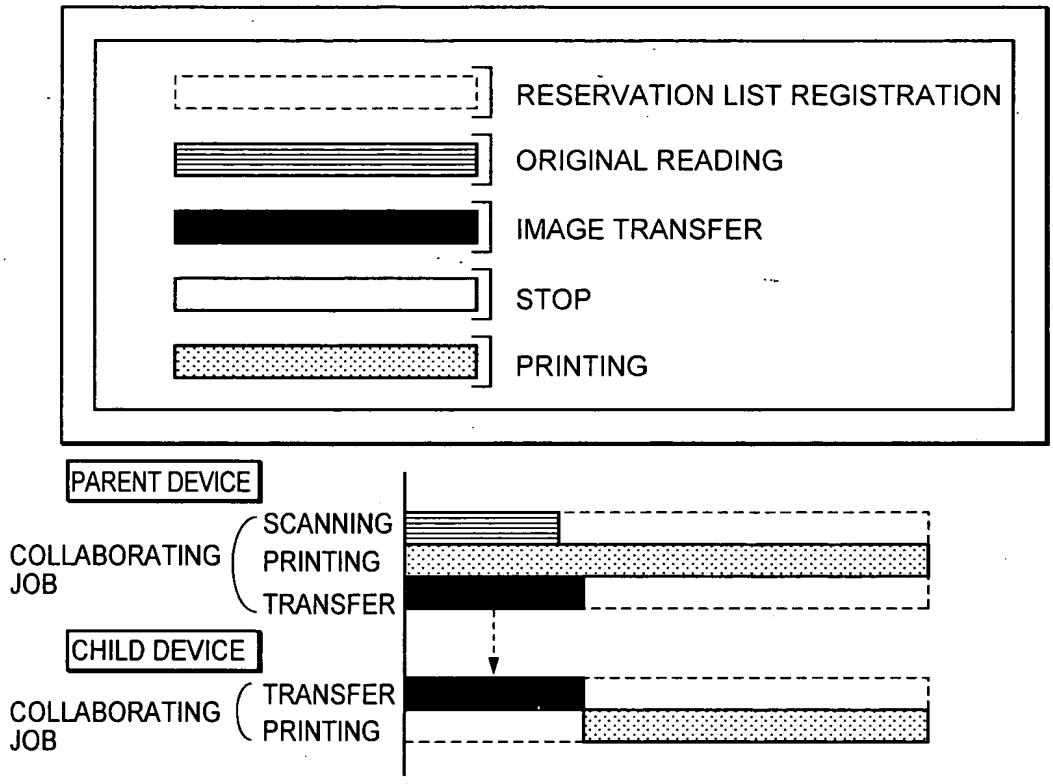

RESERVATION LIST REGISTRATION
ORIGINAL READING
IMAGE TRANSFER
STOP
PRINTING
PARENT DEVICE
COLLABORATING JOB
SCANNING
PRINTING
TRANSFER
CHILD DEVICE
COLLABORATING JOB
TRANSFER
PRINTING

FIG. 10

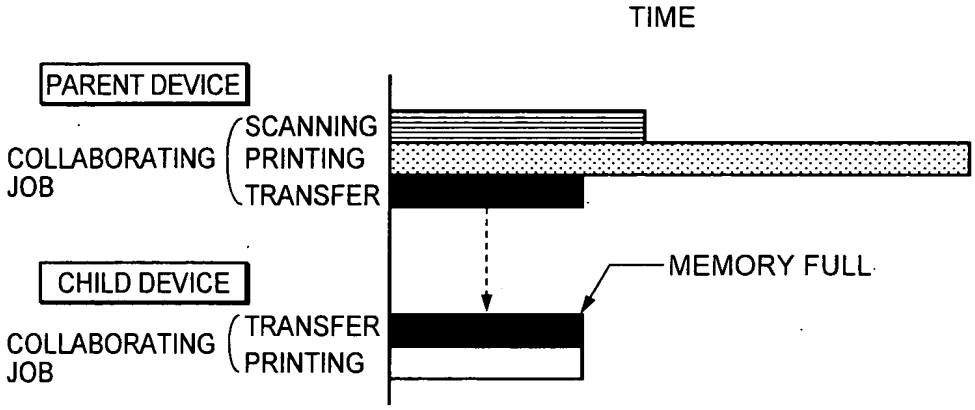

TIME
PARENT DEVICE
COLLABORATING JOB
SCANNING
PRINTING
TRANSFER
MEMORY FULL
CHILD DEVICE
COLLABORATING JOB
TRANSFER
PRINTING

FIG. 11

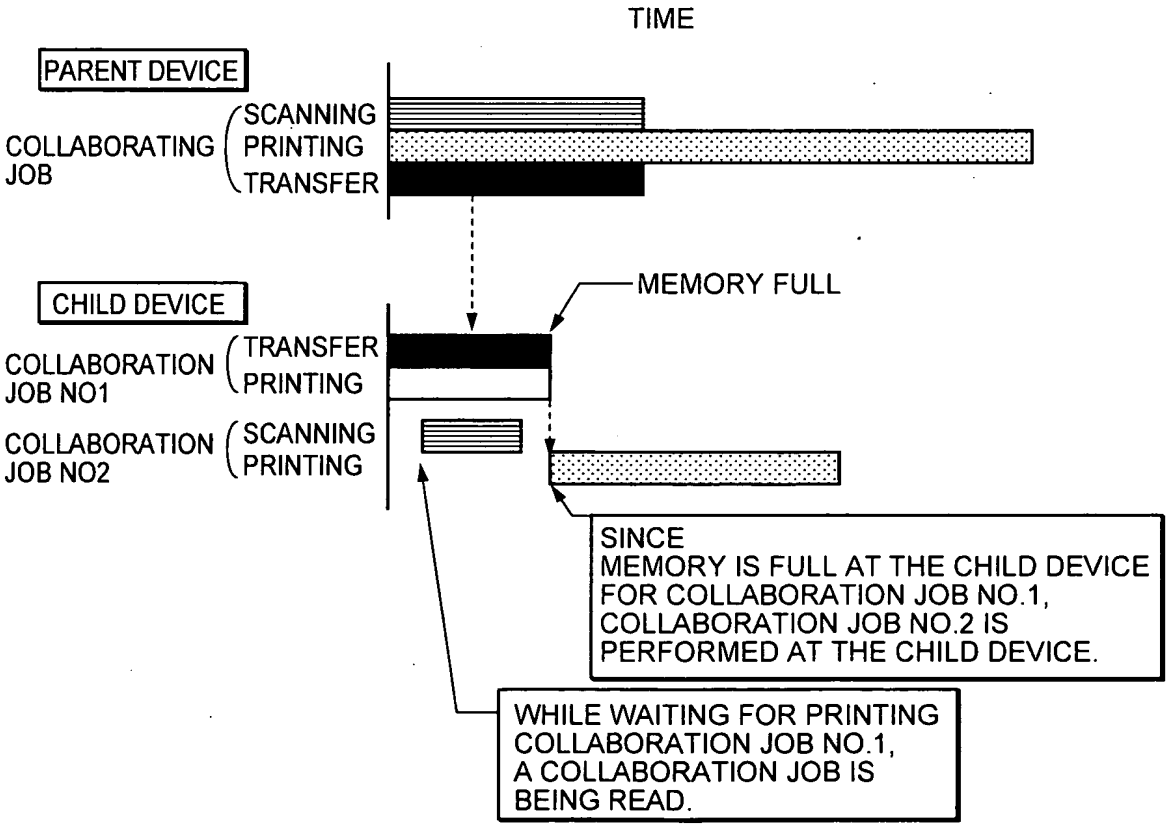

TIME
PARENT DEVICE
COLLABORATING JOB
SCANNING
PRINTING
TRANSFER
MEMORY FULL
CHILD DEVICE
COLLABORATION JOB NO1
TRANSFER
PRINTING
COLLABORATION JOB NO2
SCANNING
PRINTING
SINCE MEMORY IS FULL AT THE CHILD DEVICE FOR COLLABORATION JOB NO.1, COLLABORATION JOB NO.2 IS PERFORMED AT THE CHILD DEVICE.
WHILE WAITING FOR PRINTING COLLABORATION JOB NO.1, A COLLABORATION JOB IS BEING READ.

FIG. 12

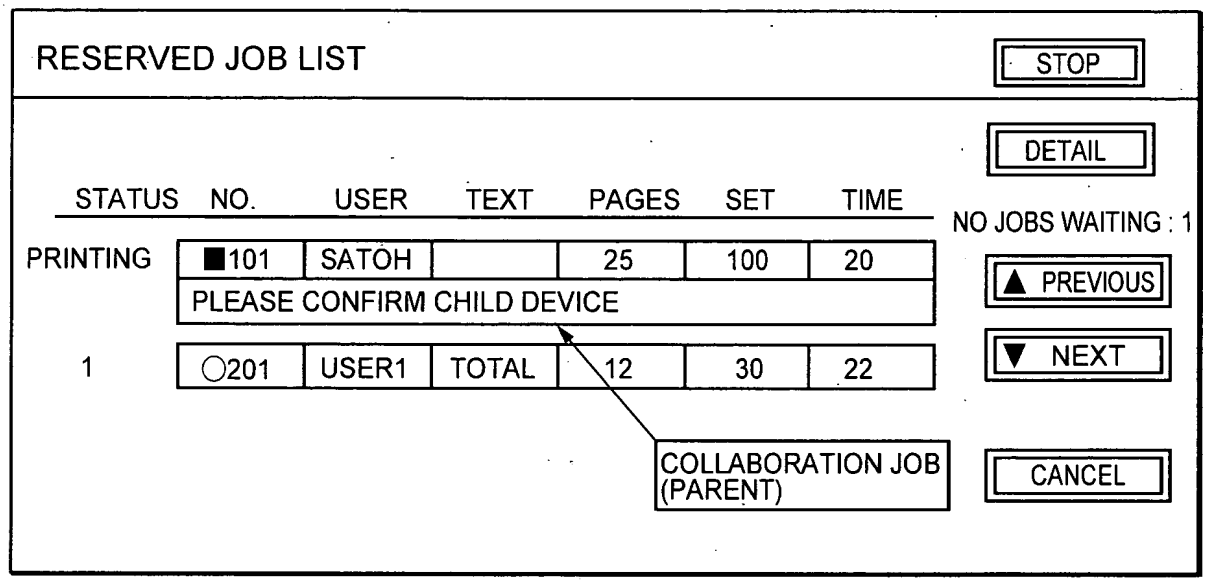

RESERVED JOB LIST
STOP
DETAIL
STATUS
NO.
USER
TEXT
PAGES
SET
TIME
NO JOBS WAITING : 1
PRINTING
■101
SATOH
25
100
20
PLEASE CONFIRM CHILD DEVICE
PREVIOUS
1
○201
USER1
TOTAL
12
30
22
NEXT
COLLABORATION JOB (PARENT)
CANCEL

FIG. 13

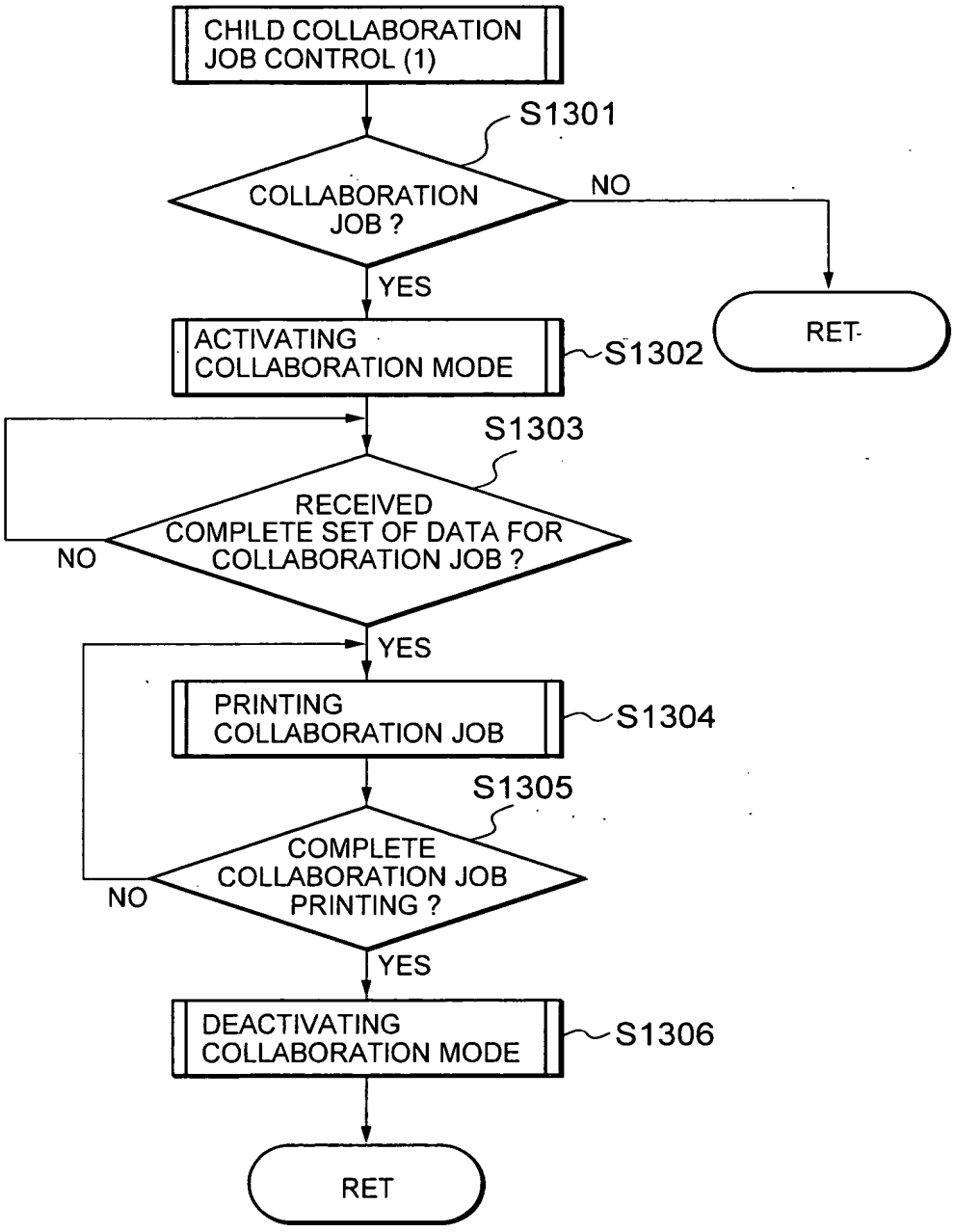

CHILD COLLABORATION JOB CONTROL (1)
S1301
COLLABORATION JOB ?
NO
YES
RET
ACTIVATING COLLABORATION MODE
S1302
S1303
RECEIVED COMPLETE SET OF DATA FOR COLLABORATION JOB ?
NO
YES
PRINTING COLLABORATION JOB
S1304
S1305
COMPLETE COLLABORATION JOB PRINTING ?
NO
YES
DEACTIVATING COLLABORATION MODE
S1306
RET

FIG. 14

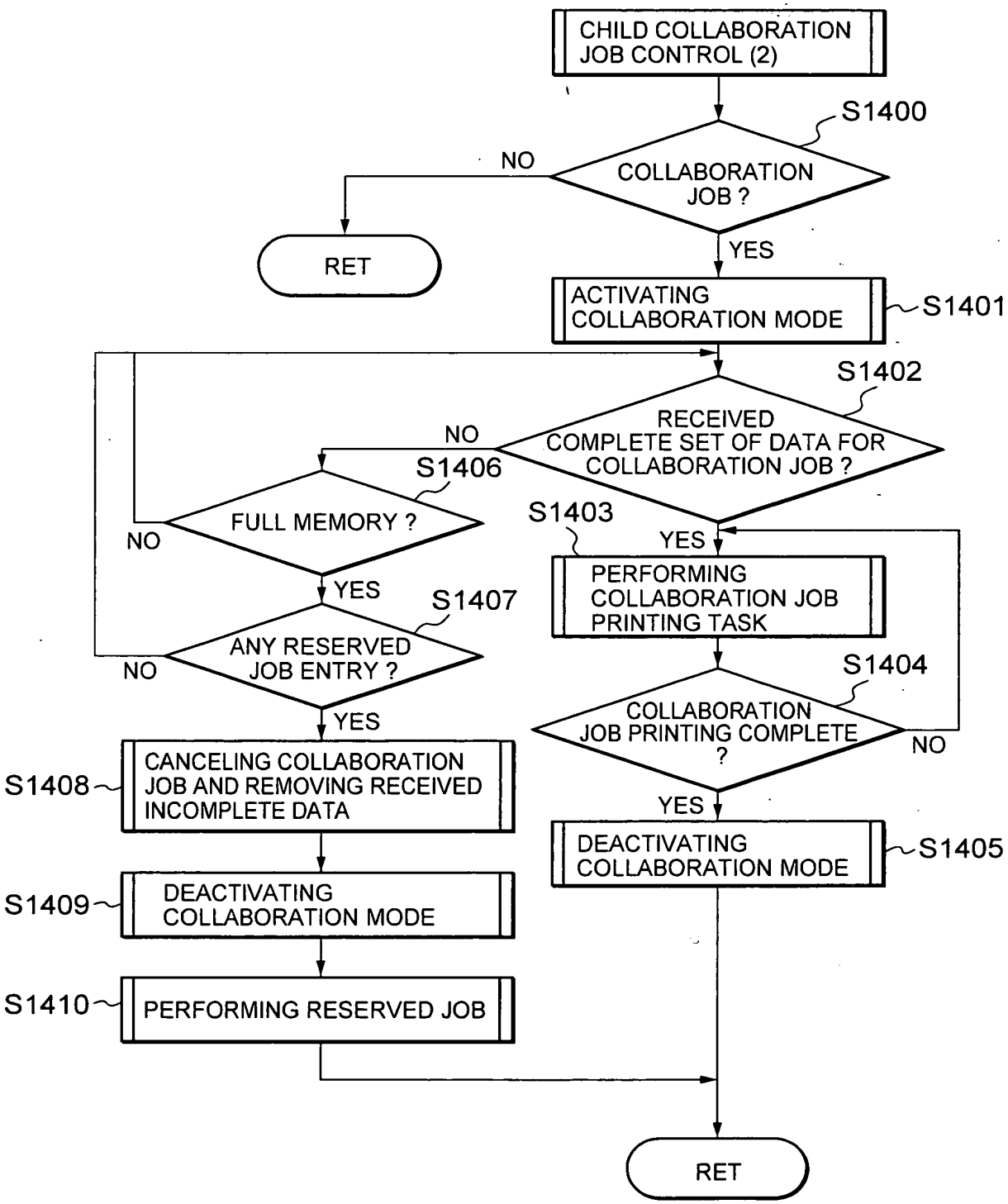

CHILD COLLABORATION JOB CONTROL (2)
S1400
COLLABORATION JOB ?
NO
YES
RET
ACTIVATING COLLABORATION MODE
S1401
S1402
RECEIVED COMPLETE SET OF DATA FOR COLLABORATION JOB ?
NO
S1406
FULL MEMORY ?
NO
YES
S1407
ANY RESERVED JOB ENTRY ?
NO
YES
S1408
CANCELING COLLABORATION JOB AND REMOVING RECEIVED INCOMPLETE DATA
S1409
DEACTIVATING COLLABORATION MODE
S1410
PERFORMING RESERVED JOB
S1403
YES
PERFORMING COLLABORATION JOB PRINTING TASK
S1404
COLLABORATION JOB PRINTING COMPLETE ?
NO
YES
DEACTIVATING COLLABORATION MODE
S1405
RET

FIG. 15A

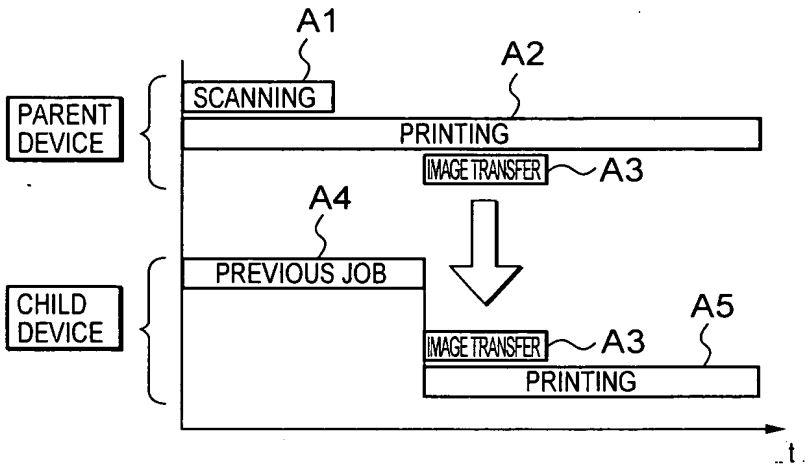



FIG. 15B

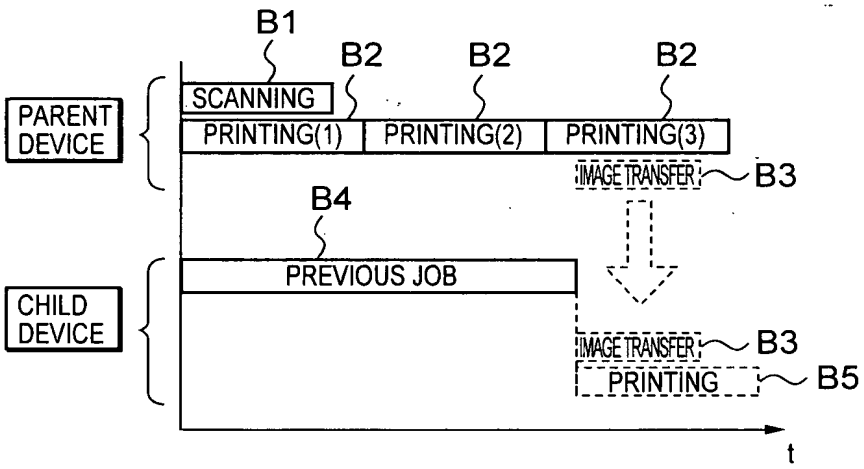



FIG. 15C

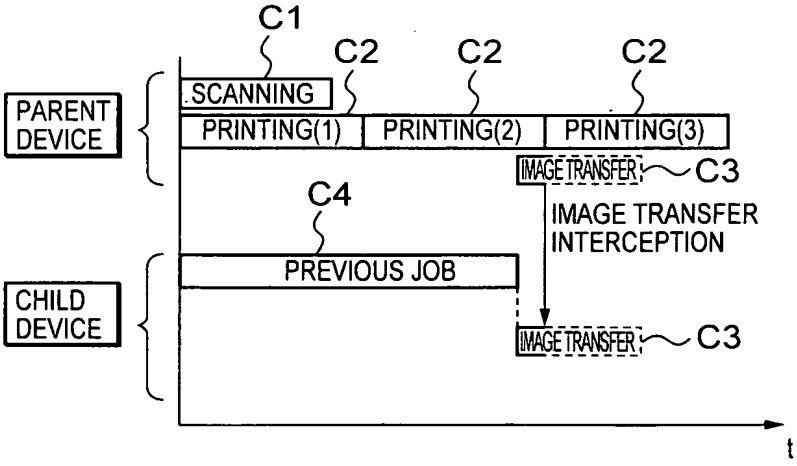


FIG. 16

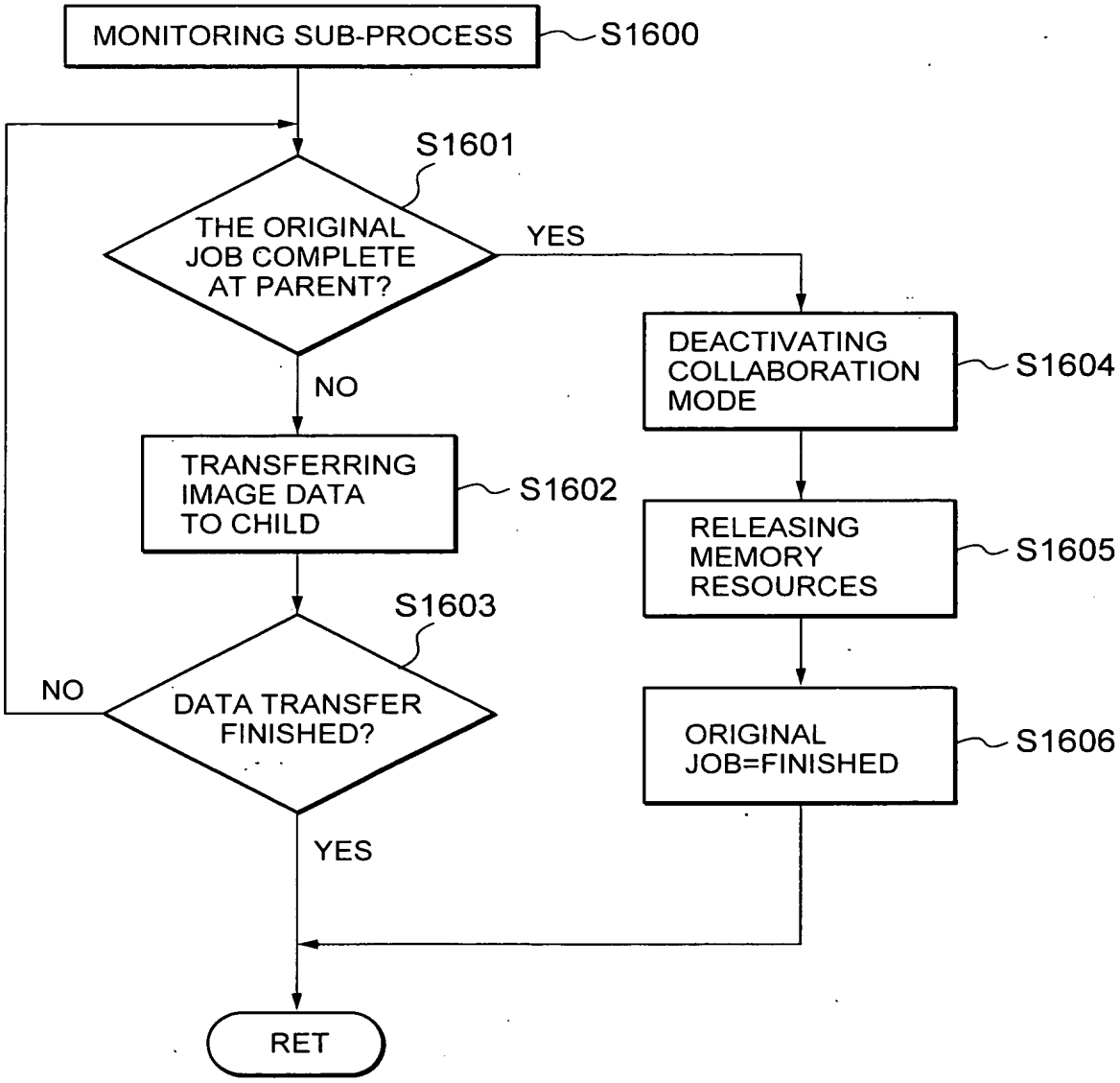

MONITORING SUB-PROCESS
S1600
S1601
THE ORIGINAL JOB COMPLETE AT PARENT?
YES
NO
DEACTIVATING COLLABORATION MODE
S1604
TRANSFERRING IMAGE DATA TO CHILD
S1602
RELEASING MEMORY RESOURCES
S1605
S1603
NO
DATA TRANSFER FINISHED?
ORIGINAL JOB=FINISHED
S1606
YES
RET

FIG. 17

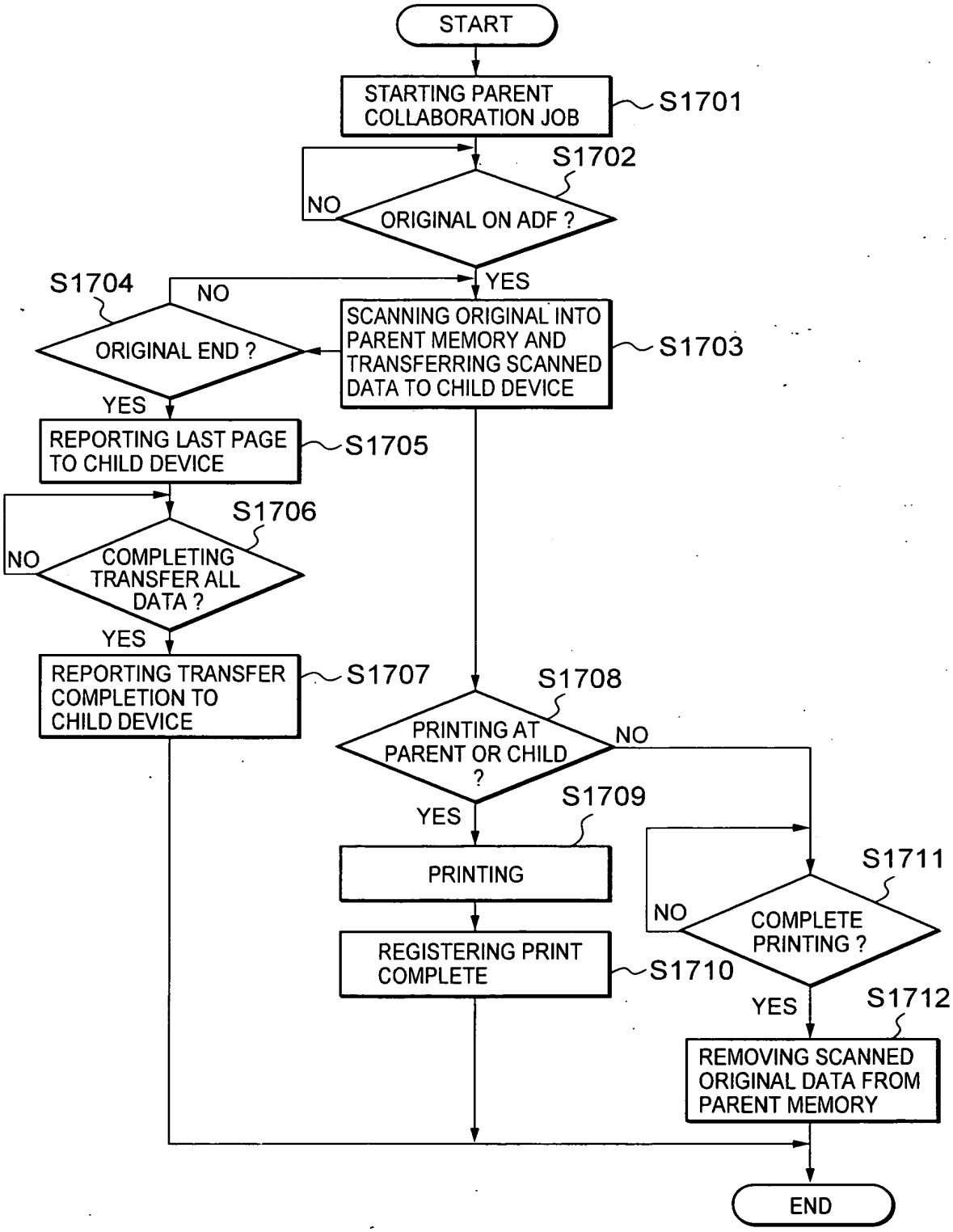

START
STARTING PARENT COLLABORATION JOB
S1701
S1702
NO
ORIGINAL ON ADF ?
YES
S1704
NO
ORIGINAL END ?
SCANNING ORIGINAL INTO PARENT MEMORY AND TRANSFERRING SCANNED DATA TO CHILD DEVICE
S1703
YES
REPORTING LAST PAGE TO CHILD DEVICE
S1705
S1706
NO
COMPLETING TRANSFER ALL DATA ?
YES
REPORTING TRANSFER COMPLETION TO CHILD DEVICE
S1707
S1708
PRINTING AT PARENT OR CHILD ?
NO
YES
S1709
PRINTING
S1711
NO
COMPLETE PRINTING ?
REGISTERING PRINT COMPLETE
S1710
YES
S1712
REMOVING SCANNED ORIGINAL DATA FROM PARENT MEMORY
END

FIG. 18

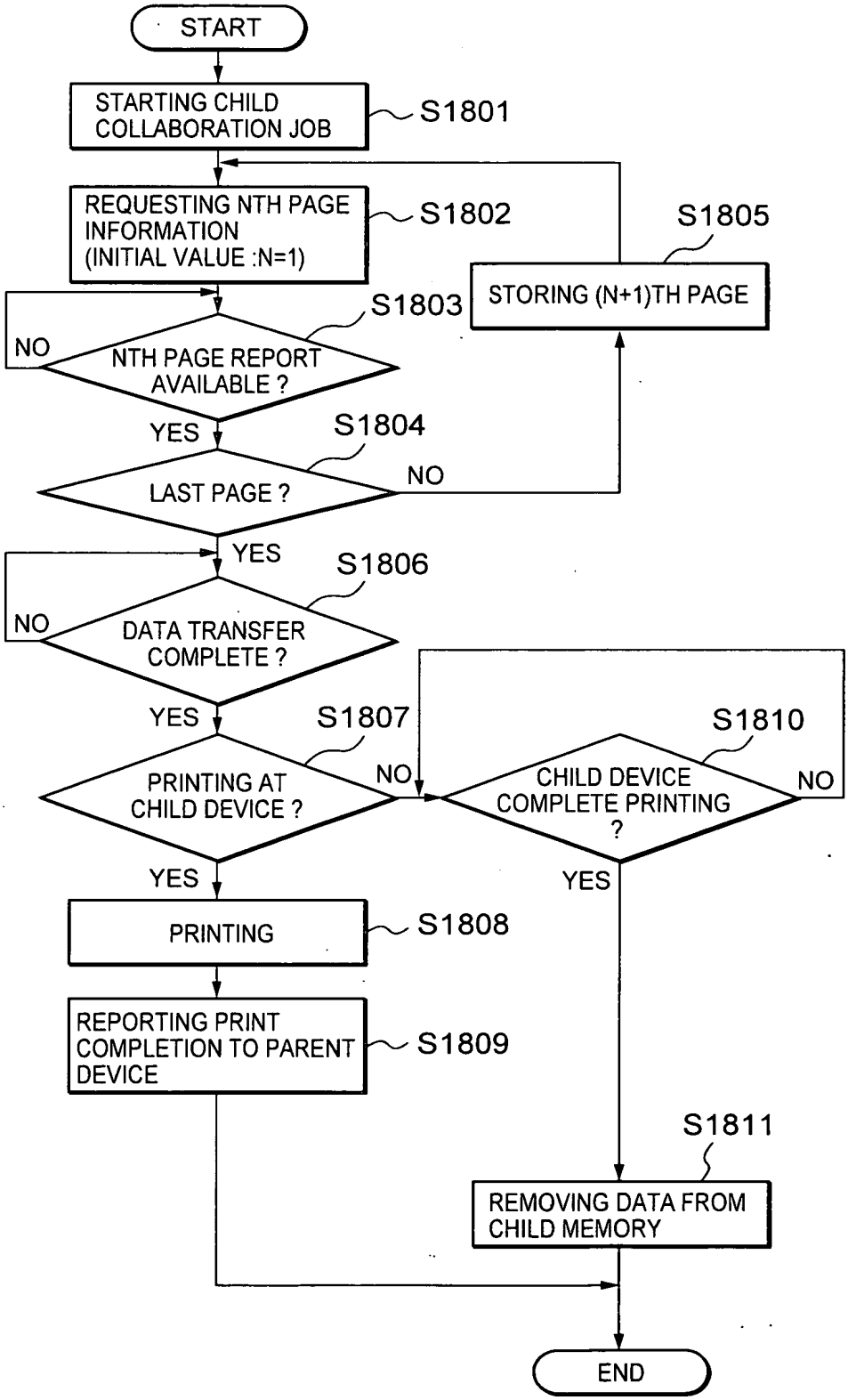

START
STARTING CHILD COLLABORATION JOB
S1801
REQUESTING NTH PAGE INFORMATION (INITIAL VALUE :N=1)
S1802
S1805
STORING (N+1)TH PAGE
S1803
NO
NTH PAGE REPORT AVAILABLE ?
YES
S1804
LAST PAGE ?
NO
YES
S1806
NO
DATA TRANSFER COMPLETE ?
YES
S1807
S1810
PRINTING AT CHILD DEVICE ?
NO
CHILD DEVICE COMPLETE PRINTING ?
NO
YES
YES
PRINTING
S1808
REPORTING PRINT COMPLETION TO PARENT DEVICE
S1809
S1811
REMOVING DATA FROM CHILD MEMORY
END

FIG. 19

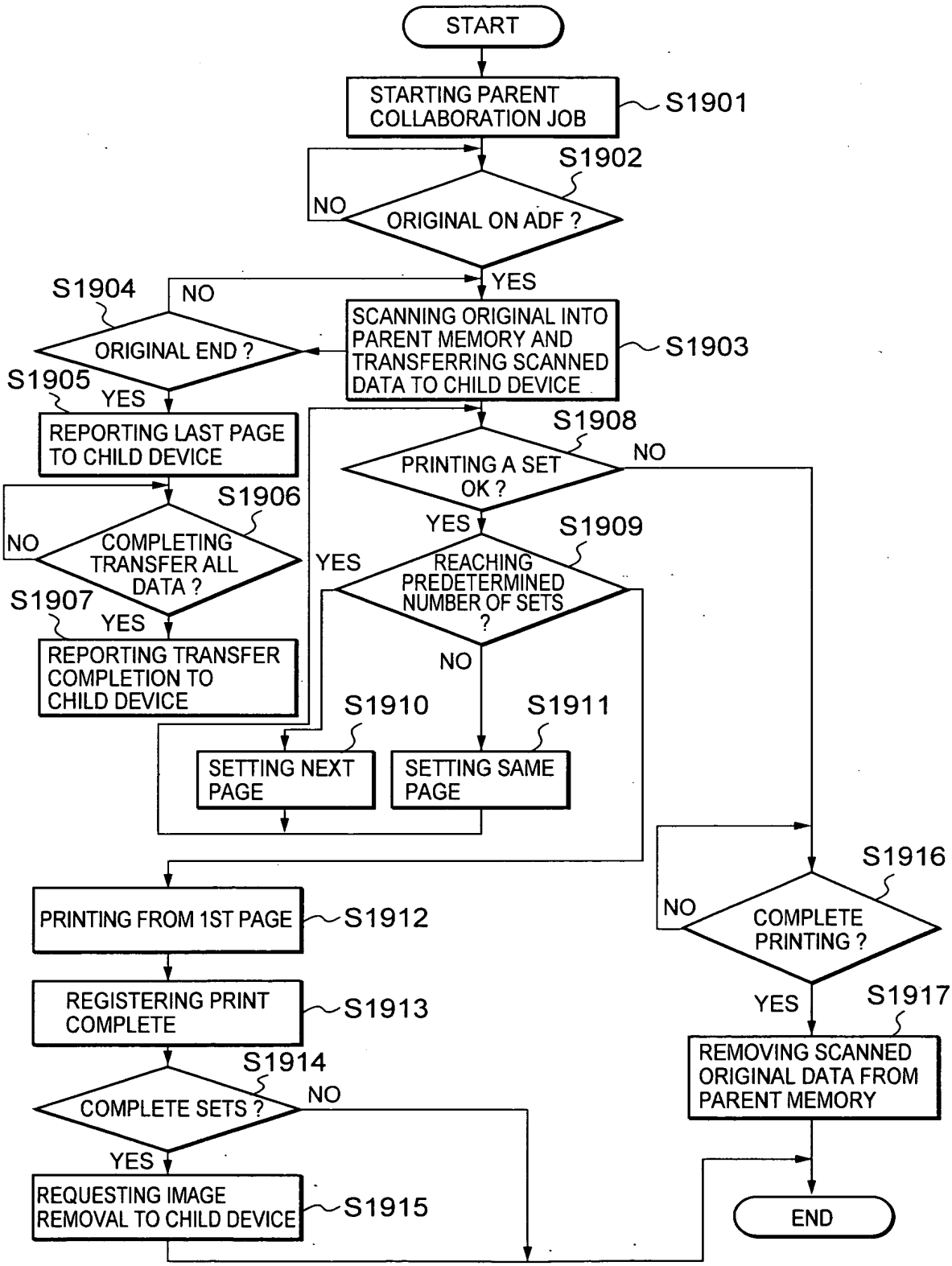

START
STARTING PARENT COLLABORATION JOB
S1901
S1902
NO
ORIGINAL ON ADF ?
YES
S1904
NO
ORIGINAL END ?
SCANNING ORIGINAL INTO PARENT MEMORY AND TRANSFERRING SCANNED DATA TO CHILD DEVICE
S1903
S1905
YES
REPORTING LAST PAGE TO CHILD DEVICE
S1908
PRINTING A SET OK ?
NO
S1906
NO
COMPLETING TRANSFER ALL DATA ?
YES
S1909
REACHING PREDETERMINED NUMBER OF SETS ?
YES
S1907
YES
REPORTING TRANSFER COMPLETION TO CHILD DEVICE
NO
S1910
S1911
SETTING NEXT PAGE
SETTING SAME PAGE
S1916
NO
COMPLETE PRINTING ?
PRINTING FROM 1ST PAGE
S1912
REGISTERING PRINT COMPLETE
S1913
YES
S1917
REMOVING SCANNED ORIGINAL DATA FROM PARENT MEMORY
S1914
COMPLETE SETS ?
NO
YES
REQUESTING IMAGE REMOVAL TO CHILD DEVICE
S1915
END

FIG. 20

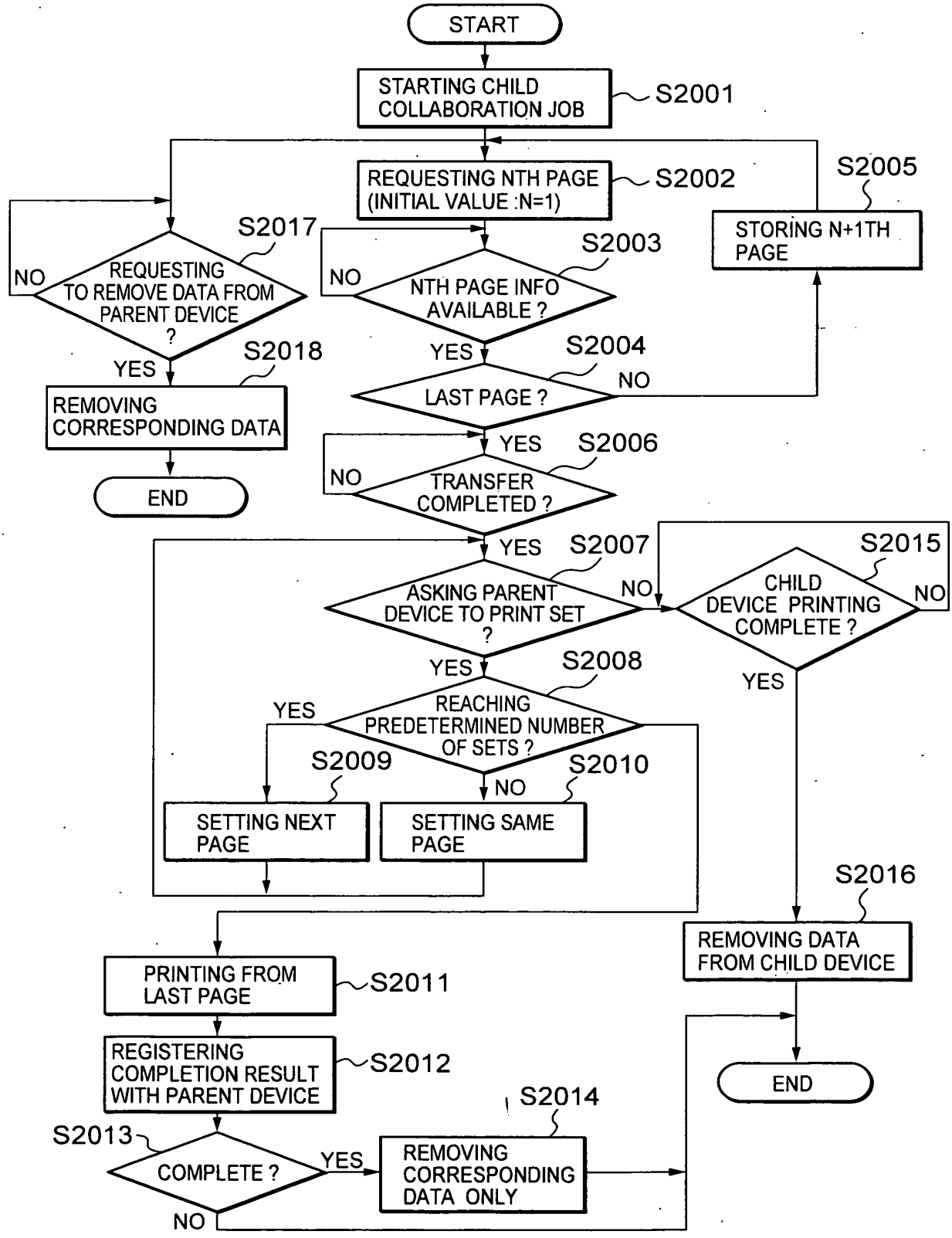

START
STARTING CHILD COLLABORATION JOB
S2001
REQUESTING NTH PAGE (INITIAL VALUE :N=1)
S2002
S2005
STORING N+1TH PAGE
S2017
REQUESTING TO REMOVE DATA FROM PARENT DEVICE ?
NO
S2003
NTH PAGE INFO AVAILABLE ?
NO
YES
S2004
LAST PAGE ?
NO
YES
S2018
REMOVING CORRESPONDING DATA
END
YES
S2006
TRANSFER COMPLETED ?
NO
YES
S2007
ASKING PARENT DEVICE TO PRINT SET ?
NO
S2015
CHILD DEVICE PRINTING COMPLETE ?
NO
YES
YES
S2008
REACHING PREDETERMINED NUMBER OF SETS ?
YES
S2009
SETTING NEXT PAGE
NO
S2010
SETTING SAME PAGE
S2016
REMOVING DATA FROM CHILD DEVICE
PRINTING FROM LAST PAGE
S2011
REGISTERING COMPLETION RESULT WITH PARENT DEVICE
S2012
S2014
S2013
COMPLETE ?
YES
REMOVING CORRESPONDING DATA ONLY
NO
END

FIG. 21

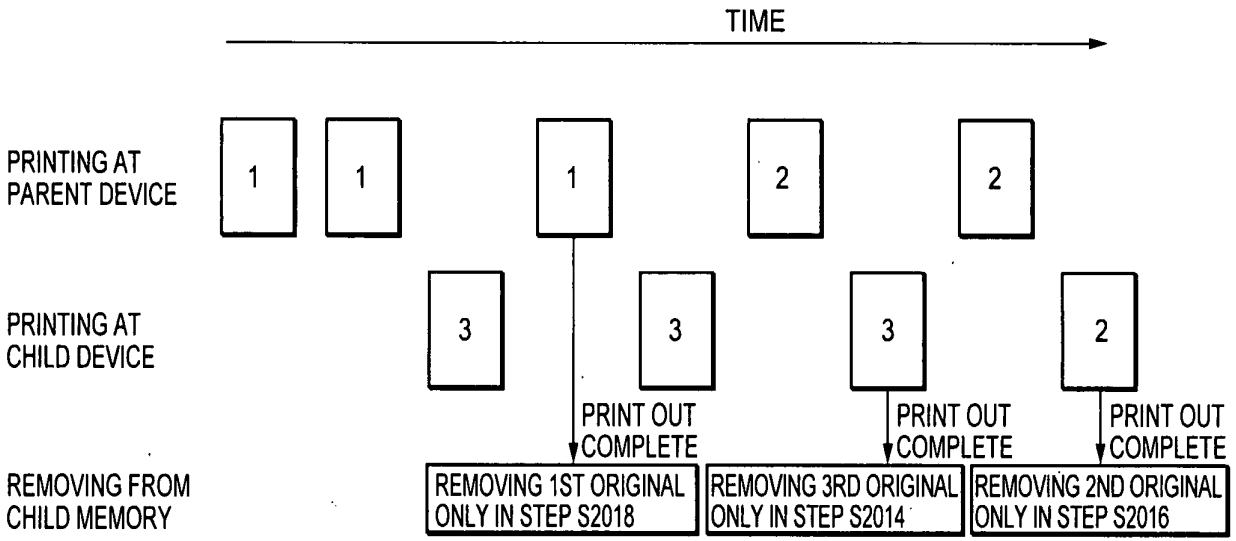

TIME
PRINTING AT PARENT DEVICE
1
1
1
2
2
PRINTING AT CHILD DEVICE
3
3
3
2
PRINT OUT COMPLETE
PRINT OUT COMPLETE
PRINT OUT COMPLETE
REMOVING FROM CHILD MEMORY
REMOVING 1ST ORIGINAL ONLY IN STEP S2018
REMOVING 3RD ORIGINAL ONLY IN STEP S2014
REMOVING 2ND ORIGINAL ONLY IN STEP S2016

FIG. 22

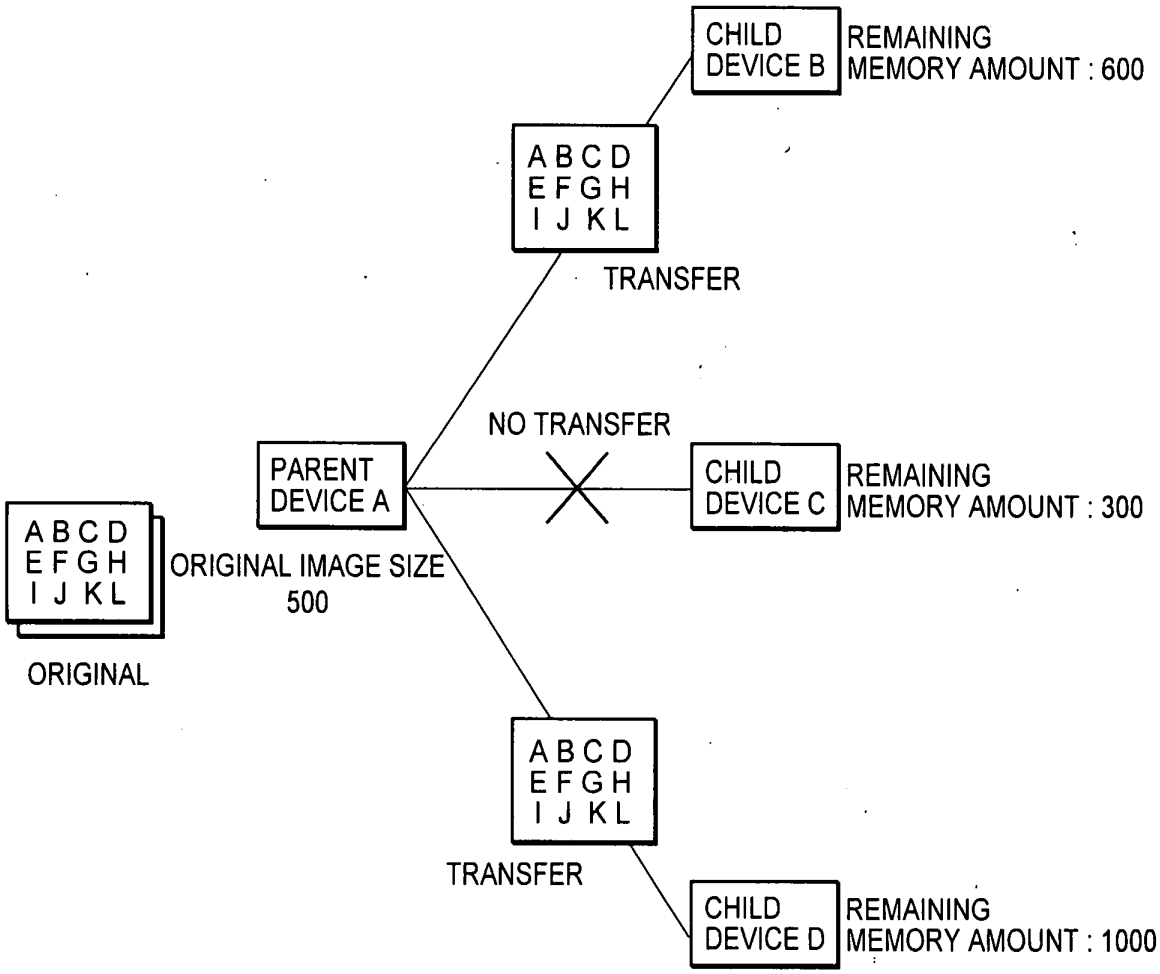

CHILD DEVICE B
REMAINING MEMORY AMOUNT : 600
A B C D E F G H I J K L
TRANSFER
NO TRANSFER
PARENT DEVICE A
CHILD DEVICE C
REMAINING MEMORY AMOUNT : 300
A B C D E F G H I J K L
ORIGINAL IMAGE SIZE 500
ORIGINAL
A B C D E F G H I J K L
TRANSFER
CHILD DEVICE D
REMAINING MEMORY AMOUNT : 1000

FIG. 23

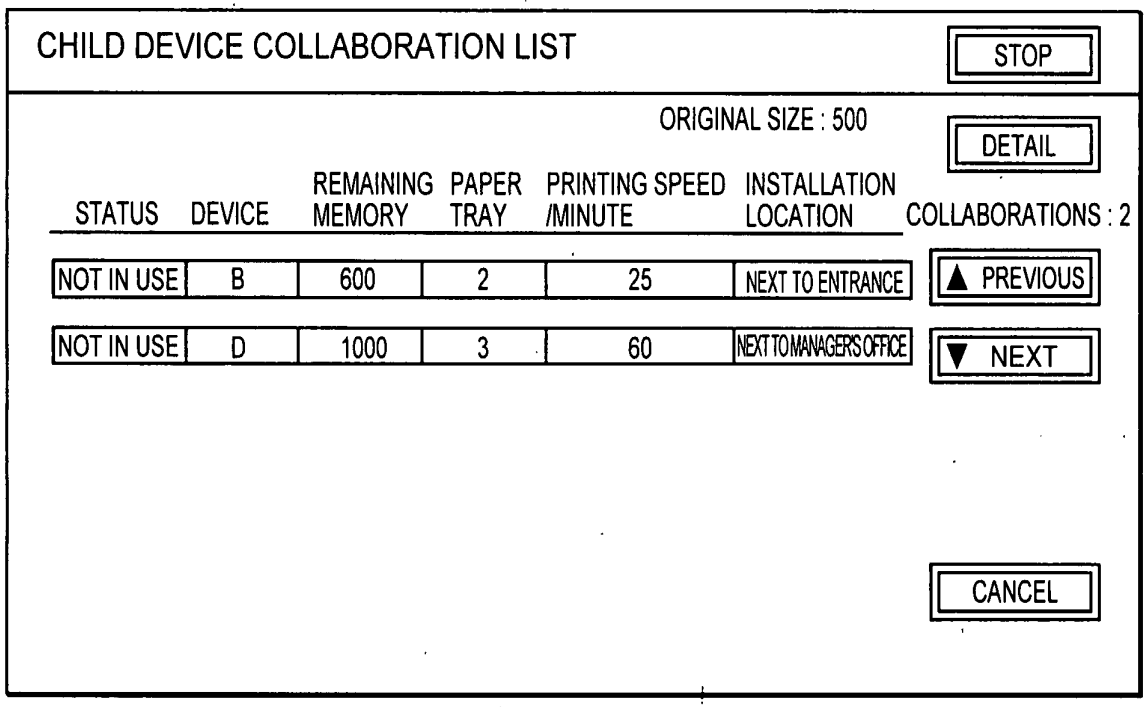

CHILD DEVICE COLLABORATION LIST
STOP
ORIGINAL SIZE : 500
DETAIL
STATUS
DEVICE
REMAINING MEMORY
PAPER TRAY
PRINTING SPEED /MINUTE
INSTALLATION LOCATION
COLLABORATIONS : 2
NOT IN USE
B
600
2
25
NEXT TO ENTRANCE
PREVIOUS
NOT IN USE
D
1000
3
60
NEXT TO MANAGER'S OFFICE
NEXT
CANCEL

FIG. 24

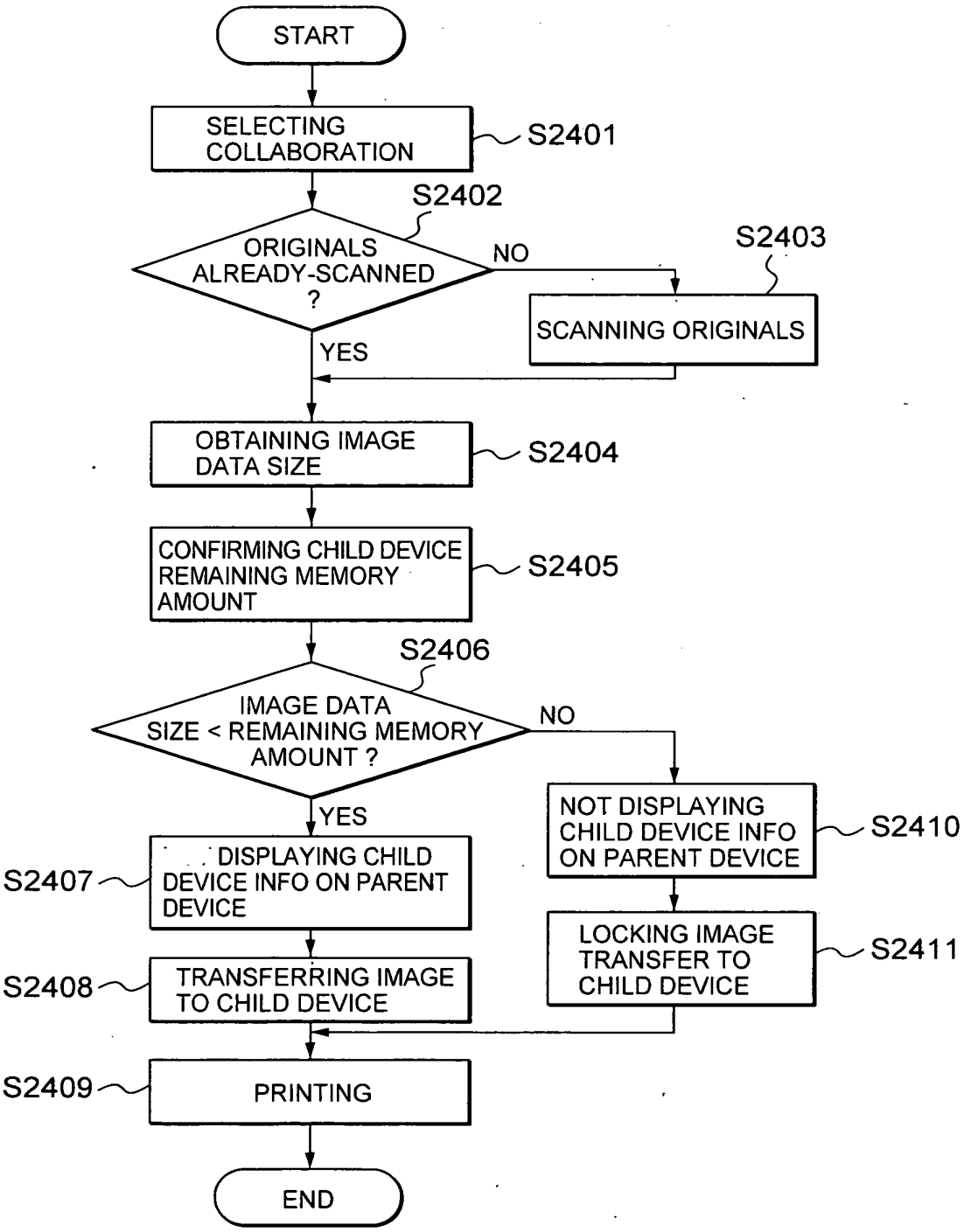

START
SELECTING COLLABORATION
S2401
S2402
ORIGINALS ALREADY-SCANNED ?
NO
S2403
SCANNING ORIGINALS
YES
OBTAINING IMAGE DATA SIZE
S2404
CONFIRMING CHILD DEVICE REMAINING MEMORY AMOUNT
S2405
S2406
IMAGE DATA SIZE < REMAINING MEMORY AMOUNT ?
NO
YES
NOT DISPLAYING CHILD DEVICE INFO ON PARENT DEVICE
S2410
S2407
DISPLAYING CHILD DEVICE INFO ON PARENT DEVICE
LOCKING IMAGE TRANSFER TO CHILD DEVICE
S2411
S2408
TRANSFERRING IMAGE TO CHILD DEVICE
S2409
PRINTING
END

FIG. 25

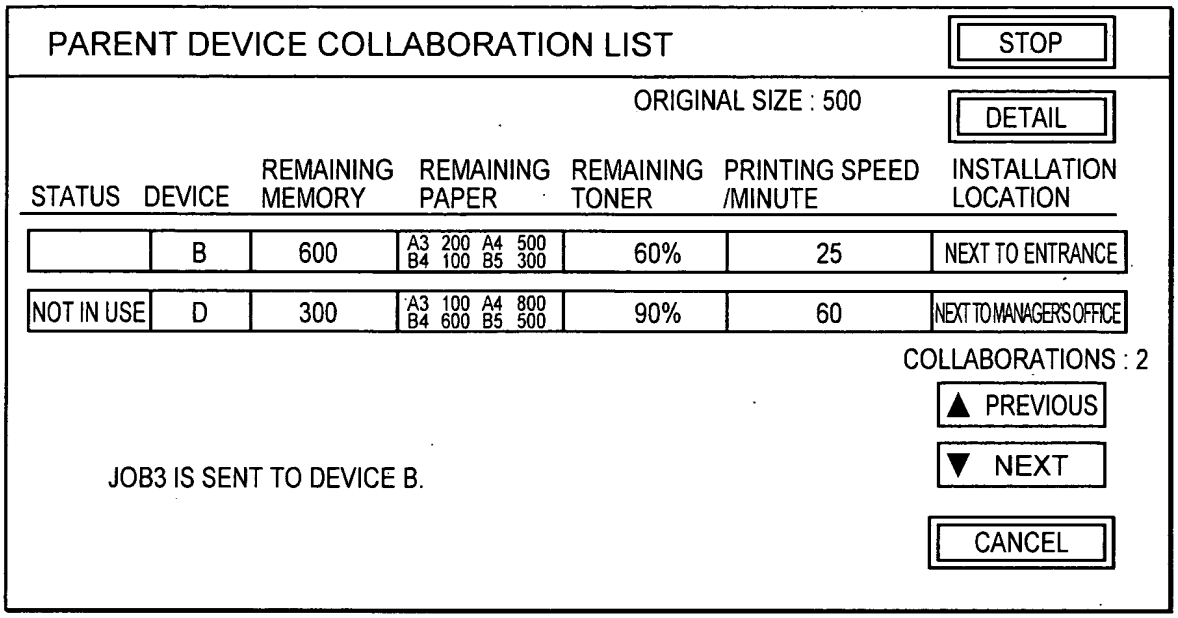

PARENT DEVICE COLLABORATION LIST
STOP
ORIGINAL SIZE : 500
DETAIL
STATUS
DEVICE
REMAINING MEMORY
REMAINING PAPER
REMAINING TONER
PRINTING SPEED /MINUTE
INSTALLATION LOCATION
B
600
A3 200 A4 500 B4 100 B5 300
60%
25
NEXT TO ENTRANCE
NOT IN USE
D
300
A3 100 A4 800 B4 600 B5 500
90%
60
NEXT TO MANAGER'S OFFICE
COLLABORATIONS : 2
PREVIOUS
NEXT
JOB3 IS SENT TO DEVICE B.
CANCEL

FIG. 26

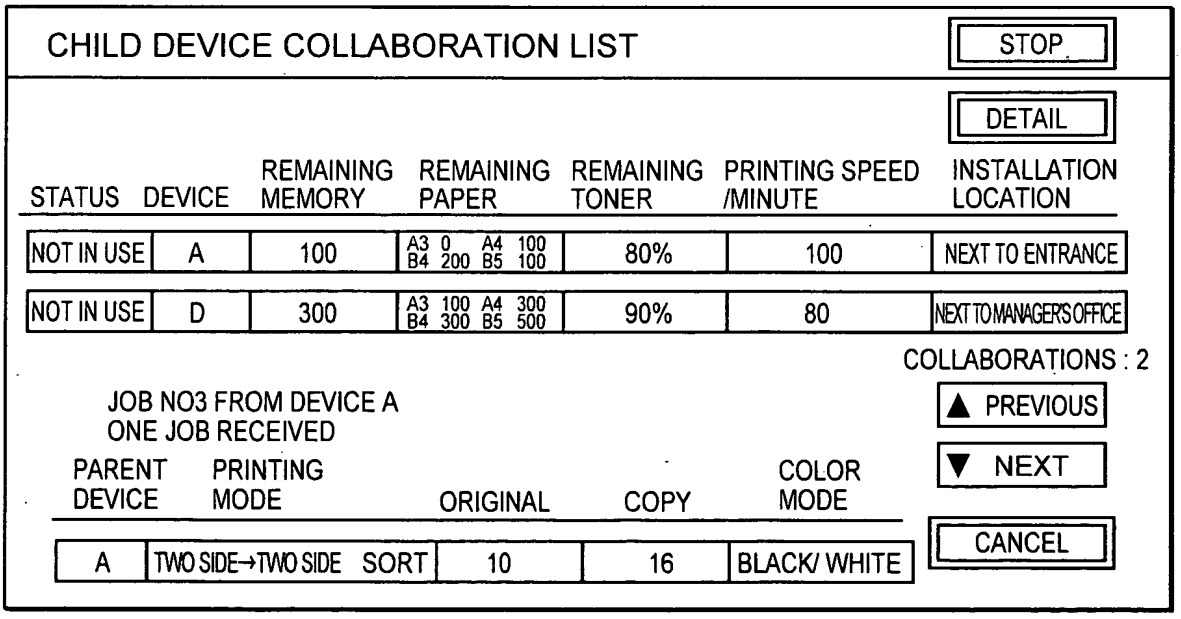

CHILD DEVICE COLLABORATION LIST
STOP
DETAIL
STATUS
DEVICE
REMAINING MEMORY
REMAINING PAPER
REMAINING TONER
PRINTING SPEED /MINUTE
INSTALLATION LOCATION
NOT IN USE
A
100
A3 0 A4 100 B4 200 B5 100
80%
100
NEXT TO ENTRANCE
NOT IN USE
D
300
A3 100 A4 300 B4 300 B5 500
90%
80
NEXT TO MANAGER'S OFFICE
COLLABORATIONS : 2
JOB NO3 FROM DEVICE A
ONE JOB RECEIVED
PREVIOUS
NEXT
PARENT DEVICE
PRINTING MODE
ORIGINAL
COPY
COLOR MODE
A
TWO SIDE→TWO SIDE SORT
10
16
BLACK/ WHITE
CANCEL

FIG. 27

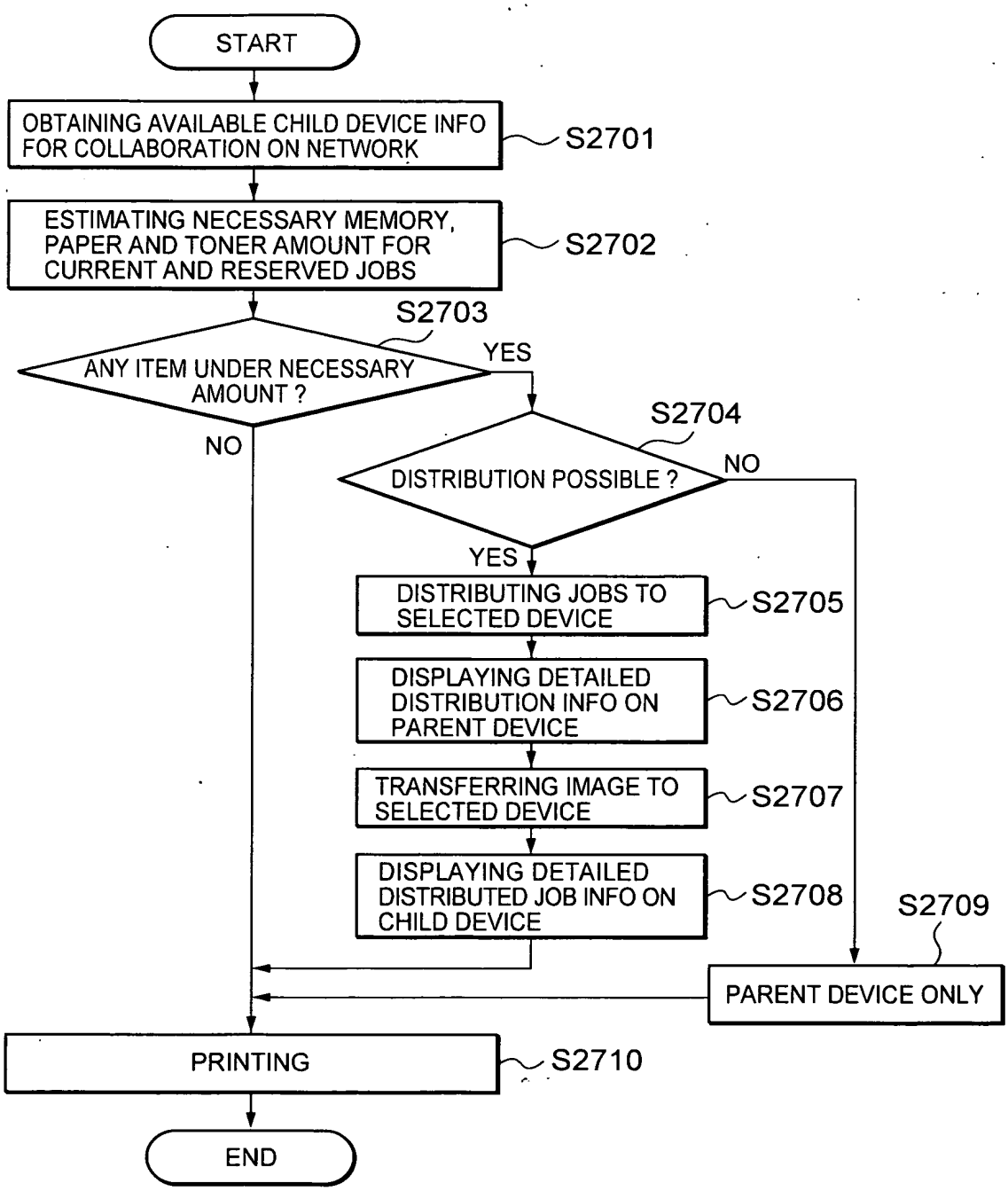

START
OBTAINING AVAILABLE CHILD DEVICE INFO FOR COLLABORATION ON NETWORK
S2701
ESTIMATING NECESSARY MEMORY, PAPER AND TONER AMOUNT FOR CURRENT AND RESERVED JOBS
S2702
S2703
ANY ITEM UNDER NECESSARY AMOUNT ?
YES
NO
S2704
DISTRIBUTION POSSIBLE ?
NO
YES
DISTRIBUTING JOBS TO SELECTED DEVICE
S2705
DISPLAYING DETAILED DISTRIBUTION INFO ON PARENT DEVICE
S2706
TRANSFERRING IMAGE TO SELECTED DEVICE
S2707
DISPLAYING DETAILED DISTRIBUTED JOB INFO ON CHILD DEVICE
S2708
S2709
PARENT DEVICE ONLY
PRINTING
S2710
END

FIG. 28

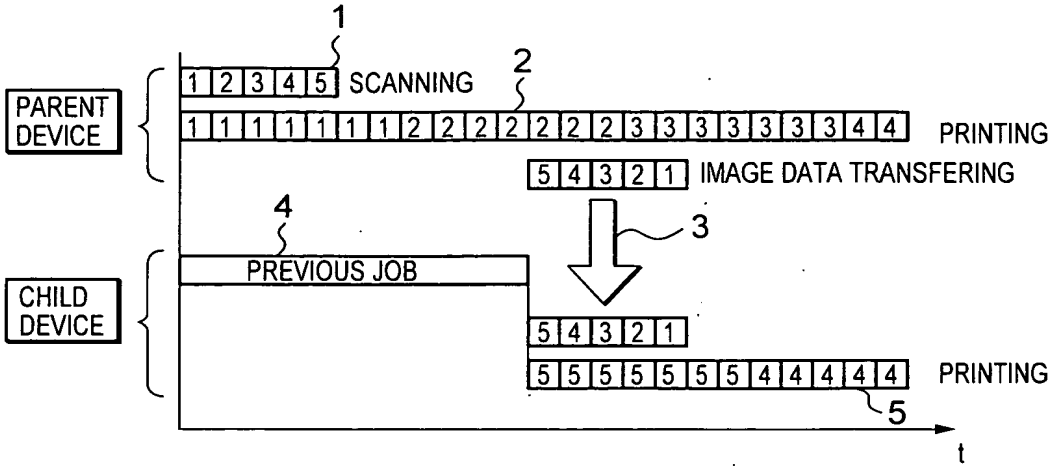



FIG. 29

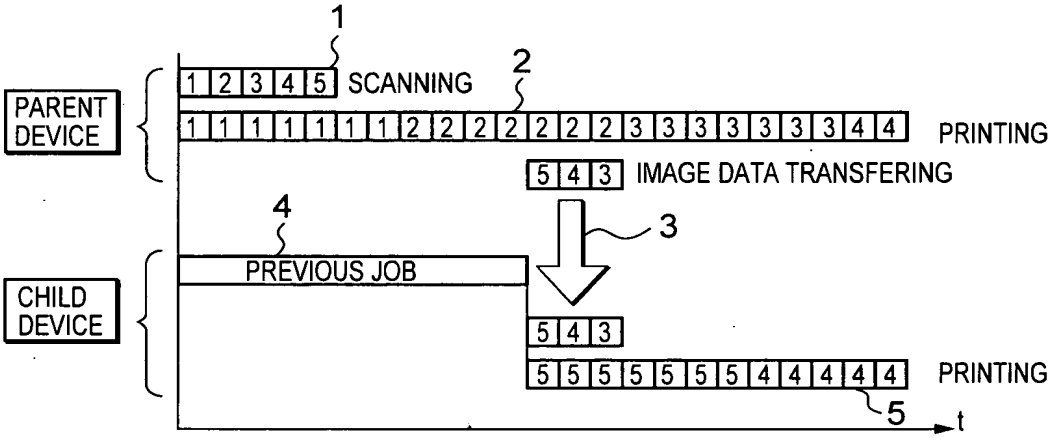



FIG. 30

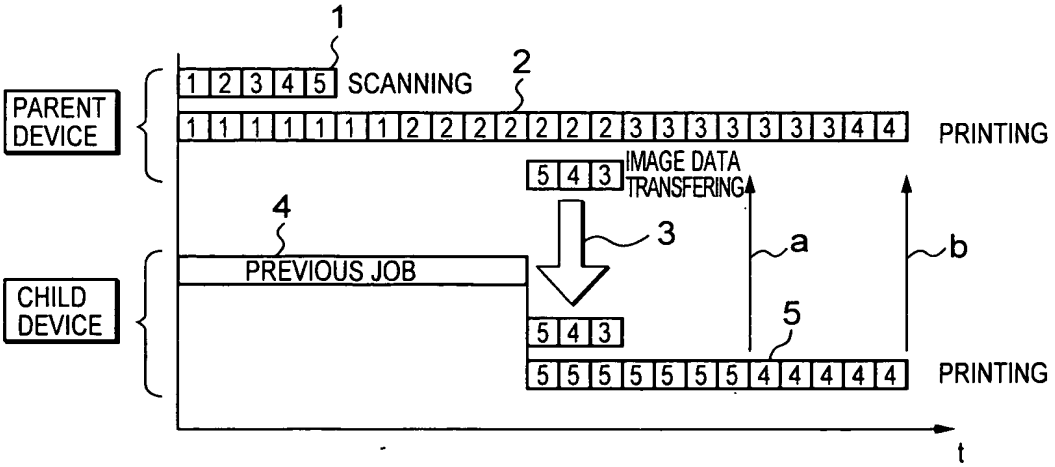


FIG. 31

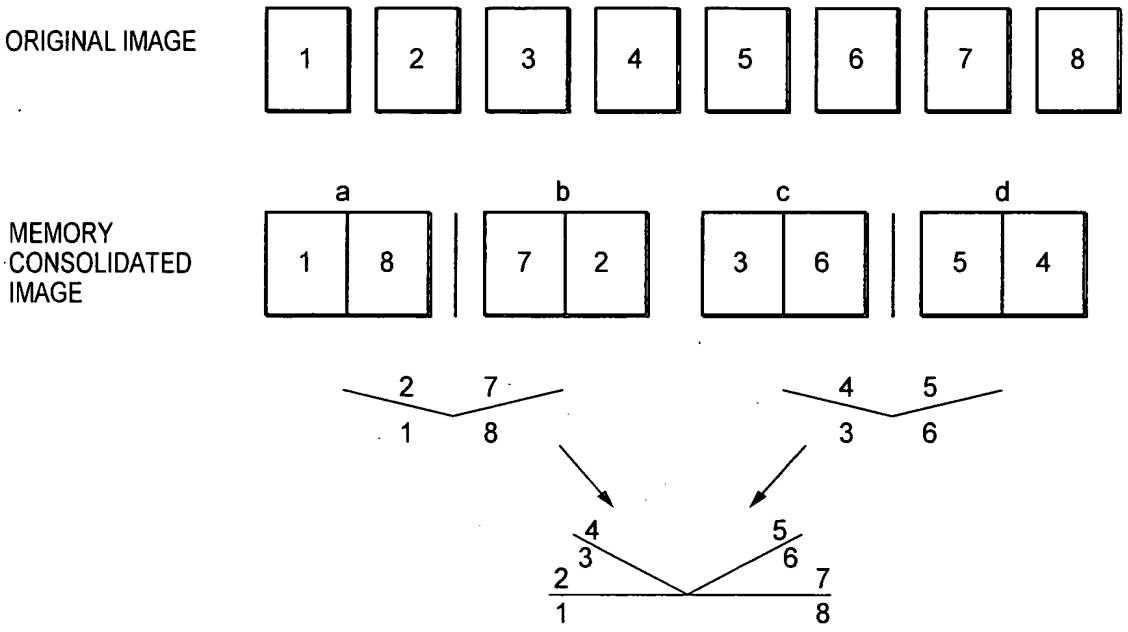

ORIGINAL IMAGE
1
2
3
4
5
6
7
8
a
b
c
d
MEMORY CONSOLIDATED IMAGE
1
8
7
2
3
6
5
4
2
7
1
8
4
5
3
6
4
5
3
6
2
7
1
8

FIG. 32

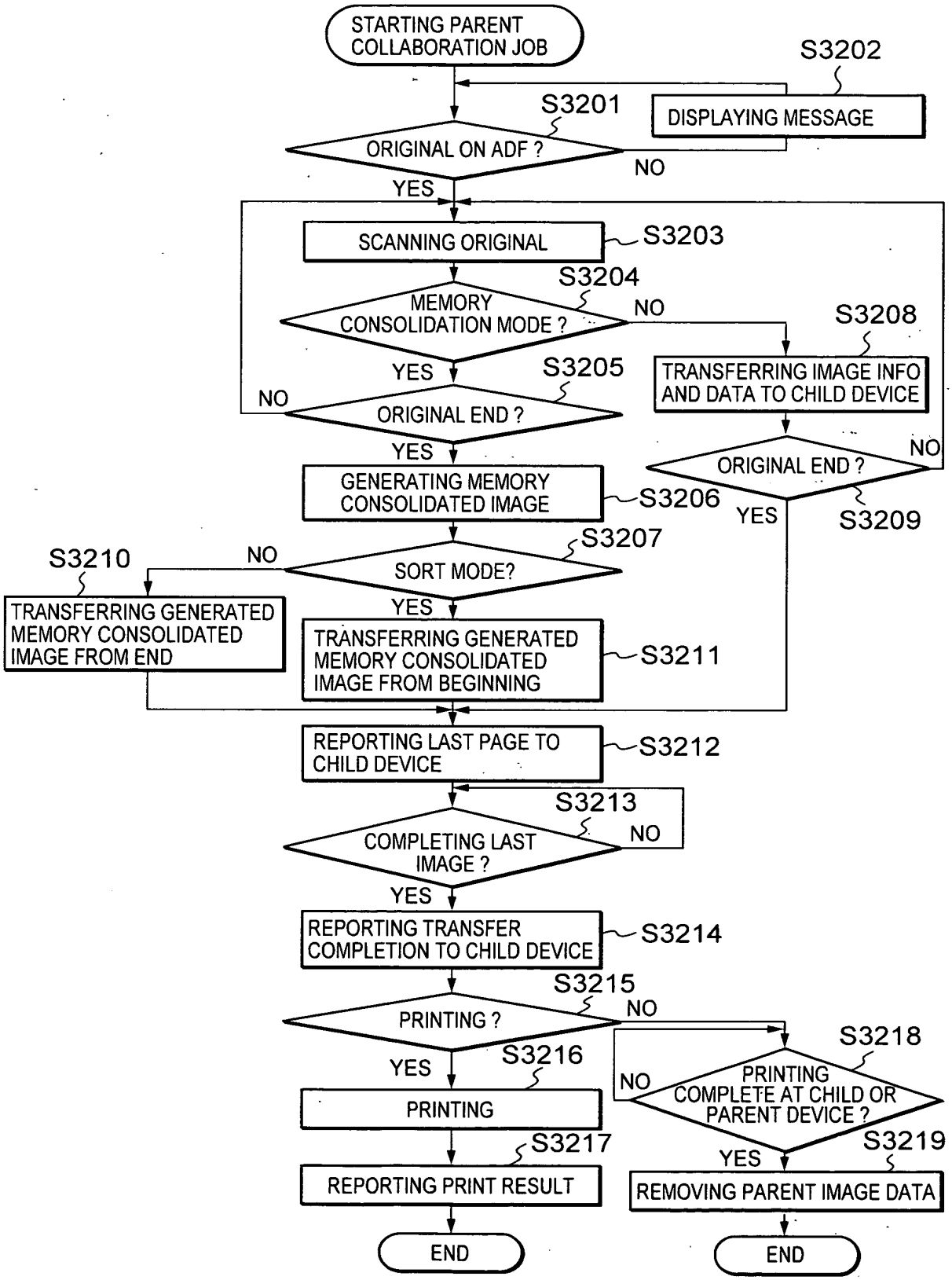

STARTING PARENT COLLABORATION JOB
S3202
DISPLAYING MESSAGE
S3201
ORIGINAL ON ADF ?
NO
YES
SCANNING ORIGINAL
S3203
S3204
MEMORY CONSOLIDATION MODE ?
NO
S3208
TRANSFERRING IMAGE INFO AND DATA TO CHILD DEVICE
YES
S3205
NO
ORIGINAL END ?
NO
ORIGINAL END ?
YES
S3209
YES
GENERATING MEMORY CONSOLIDATED IMAGE
S3206
S3207
S3210
NO
SORT MODE?
TRANSFERRING GENERATED MEMORY CONSOLIDATED IMAGE FROM END
YES
TRANSFERRING GENERATED MEMORY CONSOLIDATED IMAGE FROM BEGINNING
S3211
REPORTING LAST PAGE TO CHILD DEVICE
S3212
S3213
COMPLETING LAST IMAGE ?
NO
YES
REPORTING TRANSFER COMPLETION TO CHILD DEVICE
S3214
S3215
PRINTING ?
NO
S3218
YES
S3216
NO
PRINTING COMPLETE AT CHILD OR PARENT DEVICE ?
PRINTING
S3217
S3219
YES
REPORTING PRINT RESULT
REMOVING PARENT IMAGE DATA
END
END

FIG. 33

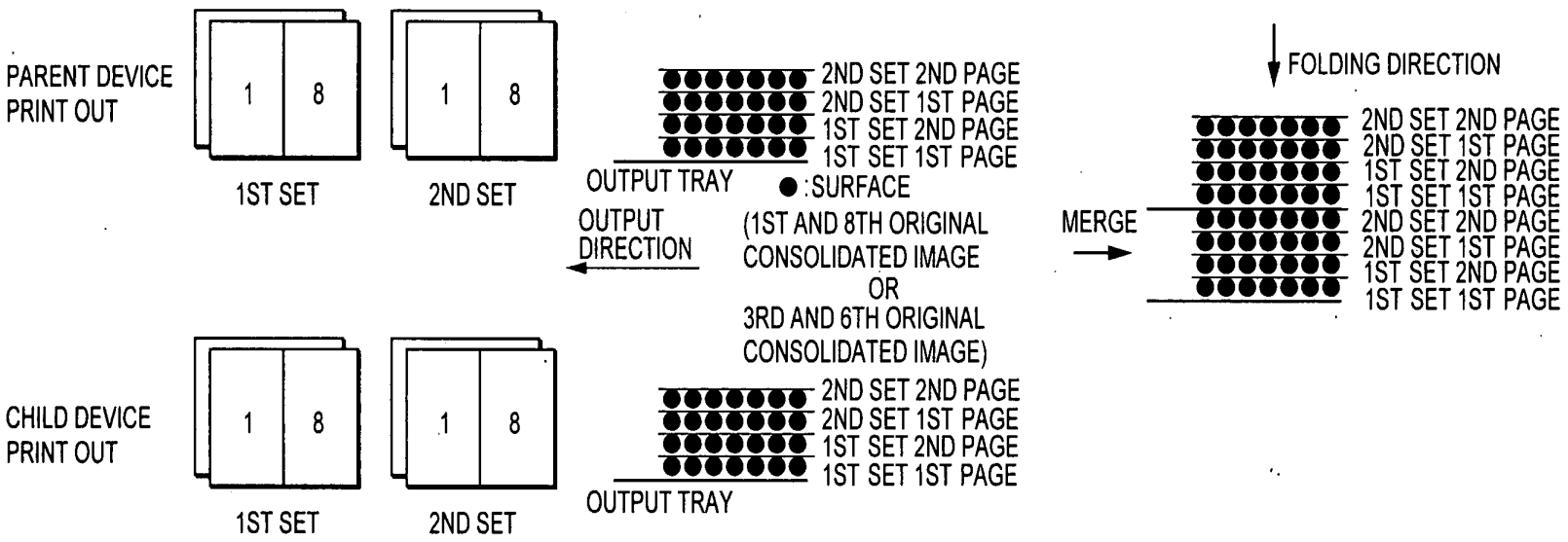

PARENT DEVICE PRINT OUT
1
8
1
8
1ST SET
2ND SET
2ND SET 2ND PAGE
2ND SET 1ST PAGE
1ST SET 2ND PAGE
1ST SET 1ST PAGE
OUTPUT TRAY
● :SURFACE
OUTPUT DIRECTION
(1ST AND 8TH ORIGINAL CONSOLIDATED IMAGE OR 3RD AND 6TH ORIGINAL CONSOLIDATED IMAGE)
CHILD DEVICE PRINT OUT
1
8
1
8
1ST SET
2ND SET
2ND SET 2ND PAGE
2ND SET 1ST PAGE
1ST SET 2ND PAGE
1ST SET 1ST PAGE
OUTPUT TRAY
FOLDING DIRECTION
MERGE
2ND SET 2ND PAGE
2ND SET 1ST PAGE
1ST SET 2ND PAGE
1ST SET 1ST PAGE
2ND SET 2ND PAGE
2ND SET 1ST PAGE
1ST SET 2ND PAGE
1ST SET 1ST PAGE

FIG. 34

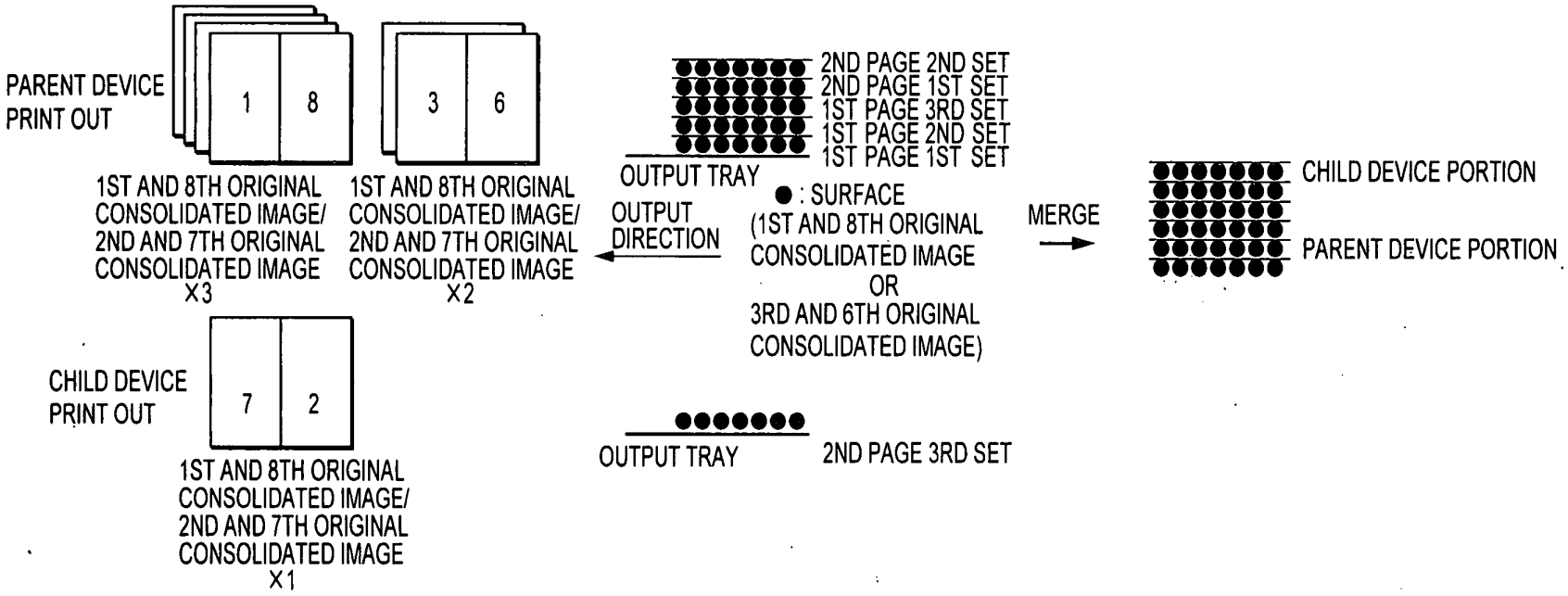
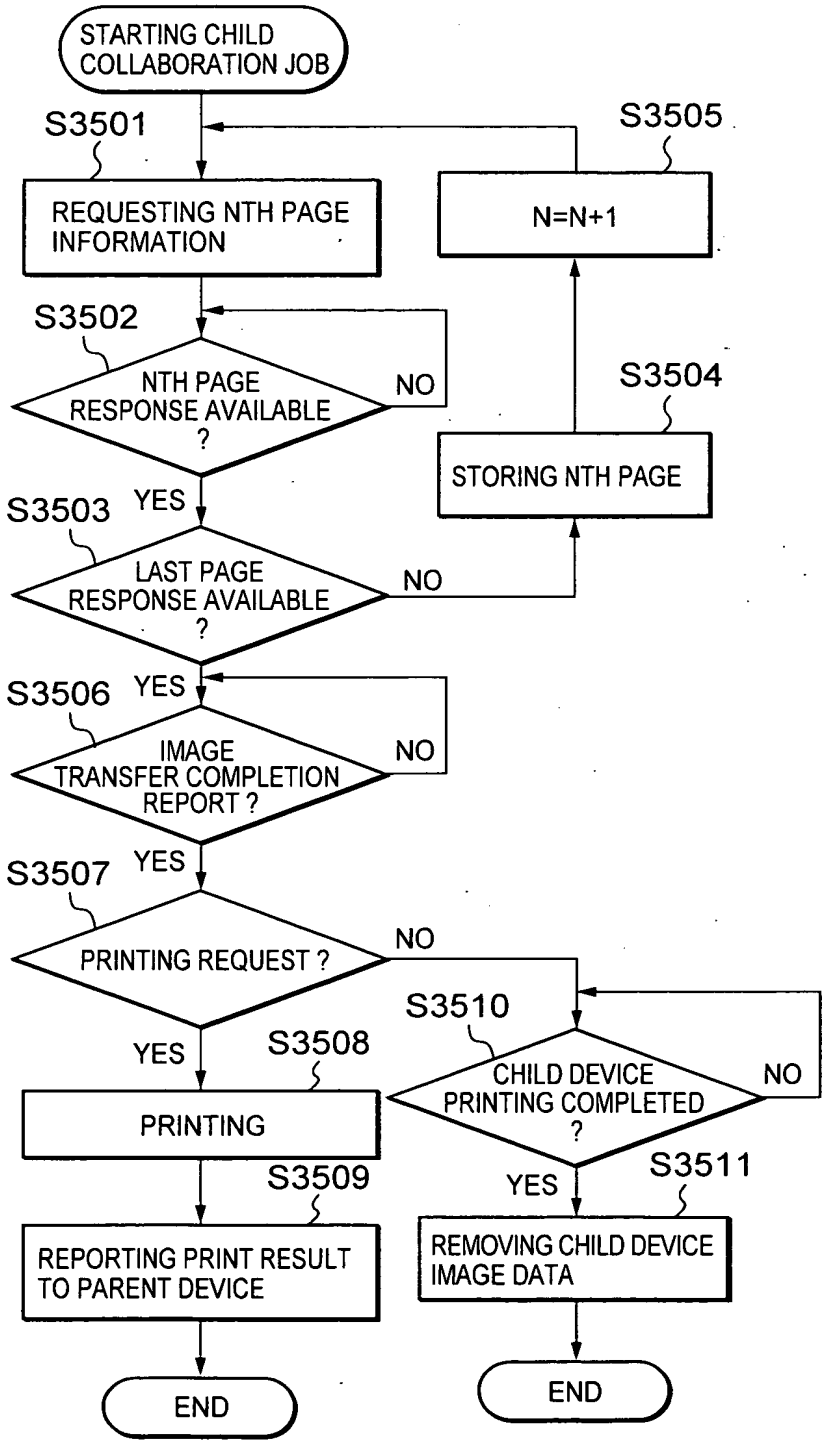

PARENT DEVICE PRINT OUT
1
8
3
6
1ST AND 8TH ORIGINAL CONSOLIDATED IMAGE/ 2ND AND 7TH ORIGINAL CONSOLIDATED IMAGE X3
1ST AND 8TH ORIGINAL CONSOLIDATED IMAGE/ 2ND AND 7TH ORIGINAL CONSOLIDATED IMAGE X2
CHILD DEVICE PRINT OUT
7
2
1ST AND 8TH ORIGINAL CONSOLIDATED IMAGE/ 2ND AND 7TH ORIGINAL CONSOLIDATED IMAGE X1
2ND PAGE 2ND SET
2ND PAGE 1ST SET
1ST PAGE 3RD SET
1ST PAGE 2ND SET
1ST PAGE 1ST SET
OUTPUT TRAY
OUTPUT DIRECTION
● : SURFACE
(1ST AND 8TH ORIGINAL CONSOLIDATED IMAGE OR 3RD AND 6TH ORIGINAL CONSOLIDATED IMAGE)
OUTPUT TRAY
2ND PAGE 3RD SET
MERGE
CHILD DEVICE PORTION
PARENT DEVICE PORTION

FIG. 35


STARTING CHILD COLLABORATION JOB
S3501
REQUESTING NTH PAGE INFORMATION
S3502
NTH PAGE RESPONSE AVAILABLE ?
NO
YES
S3503
LAST PAGE RESPONSE AVAILABLE ?
NO
YES
S3506
IMAGE TRANSFER COMPLETION REPORT ?
NO
YES
S3507
PRINTING REQUEST ?
NO
YES
S3508
PRINTING
S3509
REPORTING PRINT RESULT TO PARENT DEVICE
END
S3505
N=N+1
S3504
STORING NTH PAGE
S3510
CHILD DEVICE PRINTING COMPLETED ?
NO
YES
S3511
REMOVING CHILD DEVICE IMAGE DATA
END